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## REVISING THE CODE.

The extent to which the National Electrical Code has been revised for the 1915 edition is indicated by the report of the meeting of the Electrical Committee of the National Fire Protection Association, which will be found on other pages of this issue. It is aimed, of course, to keep the provisions of the Code abreast of developments of the electrical art, and to provide the safest standards for electrical installations which can be devised. This, of course, makes periodic revision necessary, and it also tends to add to the bulk of the rules as new points are covered from time to time. To meet this objection of bulkiness, the Electrical Committee has very wisely decided this year to omit from the regular edition of the Code the detailed specifications covering cabinets, rubber-covered wire, fixtures and insulating joints. Skeleton outlines of the requirements in these cases will be printed in the Code, and the full details published in the form of separate pamphlets which will be available for those interested. The specifications for the manufacture of these articles are referred to principally by manufacturers and by the Underwriters' Laboratories, or other testing authorities. For the inspector in the field, it is sufficient to know that a given brand has been approved by the Laboratories. The publication of such specifications separately should, therefore, meet with the approval of all interested.

While the evolution of the Code and the process of revising it biennially has so far given general satisfaction, it must be admitted that the method by which revisions are accomplished leaves something to be desired. The present method is for the Electrical Committee of the National Fire Protection Association to present its recommendations, covering such subjects as have been announced in the preliminary bulletin published by it, to an open meeting which any interested person may attend, and in whose deliberations he may participate to the extent of voting. It is evident that a vote taken in this way may be determined in the case of a general difference of opinion by persons who have not given the subject a great deal of study, by persons whose decision is made up hastily from the arguments advanced in the meeting, or by persons whose vote is influenced by selfish considerations of individual financial interest in the matter under consideration. The results of careful study by the various committees which have been investigating important questions involved in proposed code rules, and even the judgment of the Electrical Committee itself, may be overruled in this manner. Responsibility for

the final adoption or rejection of a proposed rule does not rest with the Electrical Committee; nor with any other authoritative body. The constitution of the meeting which decided this point may be unknown, since all of those present may not have registered, and the possibility arises of provisions being inserted in the Code for which no one will stand sponsor.

The status of the National Electrical Code under these circumstances becomes somewhat questionable. Originally intended to protect the insurance companies by preventing undue fire hazards, the Code has come to represent the best practices in electrical construction, from the standpoints of both fire and life hazards. It has been adopted by many of the smaller municipalities, and thus given legal status. Continuity in its development is greatly to be desired, and it would be unfortunate if the means were left open for future revisions which should not represent the best practice and knowledge of the time.

Many of the larger municipalities have adopted electrical codes of their own, but these are in the main patterned after the National Electrical Code. Where a municipal regulation conflicts with the National Code, local underwriters are perforce compelled to disregard the National Code in determining the acceptability of a risk. In cases where installations meet with the requirements of a municipal code, but do not comply with the National Code, even though the two may not be in direct conflict, we believe the general attitude of the underwriters is to accept the local regulations as sufficient, and, considering the growing tendency for governmental regulation of the insurance business, such an attitude might perhaps have to be taken involuntarily if not voluntarily. Nevertheless, the National Electrical Code is an important instrument, which serves as a guide for electrical construction throughout a large part of this country. Its provisions have almost the effect of law in many places where the Code may actually have no legal status. From every consideration, it is important not only that revisions of the Code should be made by those fully conversant with both the theory and practice of electrical work, but the revision should be so made that responsibility for the adoption of Code rules shall rest with some definite and authoritative body. The announcement of the Electrical Committee for the meeting held last week stated the meeting to be one of the Electrical Committee, but the chairman of the conference stated that it was a meeting of those interested in the hazards connected with electrical construction work. As pointed out above, anyone interested in the subject is, under this method, in a position to vote, and consequently exercise a certain amount of influence as to the adoption of any proposed rule. The possibilities of the misuse and abuse of this power are evident, and although this may never have occurred in the past, there can be no guarantee that it will not occur in the future. The method of revising the Code should certainly be itself so revised as to put authority and responsibility for the Code rules in definite and competent hands.

## ELECTRICAL PROSPERITY WEEK.

As announced in a recent issue, the Executive Committee of Five of the Society for Electrical Development, Incorporated, has decided that the first week in December will be devoted to a nation-wide celebration of the utilization of electrical apparatus and supplies. The Executive Committee is composed of some of the leading men in the central-station, manufacturing, jobbing and contracting fields, together with representatives of the technical press and the representatives of the Society for Electrical Development.

Now that the time for the celebration has been definitely set, it is interesting to note that after much conference it has been decided to designate the celebration as "Electrical Prosperity Week." A budget will be prepared and submitted to the Executive Committee at its next meeting on April 7. The committee will also appoint 50 men from various parts of the country to co-operate actively with the General Committee in carrying out the details of the propaganda. A national advertising campaign will be carried in magazines, while newspaper advertising will emphasize the campaign in each locality. Special film attractions will be prepared for utilization at the leading motion-picture houses, millions of poster stamps will be used to spread the campaign publicity, while electric signs, billboards and car cards everywhere will go far to awaken enthusiasm.

It is expected that the united electrical industry will get behind this big movement, which will unquestionably result in a remarkable quickening of interest in the utilization of things electrical and confer a mutual benefit upon the trade and the public at large.

## PERFECTING PLANT DETAILS.

As long as power plants and substations are designed, there will be differences in detail which will make such work interesting. The casual visitor to such installations may not appreciate the bearing of these details upon convenient, efficient and safe operation, but to the engineer such matters are highly significant. The study of plant design with the object of seeing where details can be perfected is well worth while.

To take one or two examples, in a substation recently examined, the rheostat grids used in starting a motor-generator set were mounted on a fireproof frame well out of reach of operators working on the floor, but the planes of the grids were horizontal instead of vertical. This meant that in case of sagging the grids would tend to short-circuit. The cost of mounting the grids properly would probably have been no more than with the arrangement followed, and vertical mounting would have increased the reliability factor of the installation, protecting the motor equipment from excessive rush of current in case the sagging above mentioned took place. Behind the switchboard in this plant

were no permanent lighting arrangements, and the desirability of being able to work rapidly and safely among the oil switches and high-tension bus compartments should have been recognized in laying out the installation. In these days of conduit wiring and moisture-proof fittings the installation of permanent lighting units is entirely safe around all corners of a plant provided due regard is given to clearances, and the small percentage of the time that such illumination is required justifies the use of lamps of large wattage if necessary to insure convenient work in locations where care is necessary in handling tools and the person.

In another instance, no facilities were provided to enable a transformer oil-discharge pipe to be quickly opened in case it became necessary to let the oil run out of the building. Each transformer was provided with oil outlet pipes, but the valves were only usable by the employment of wrenches, and the latter were conspicuous by their absence. In the early days of "tuning up" an installation, many of these details are necessarily overlooked, but as a plant gets into the smooth running period, the consideration of such details is an important piece of work. Some of them belong to the designer, but many others can be attended to by those in charge of the plant in service, and it is surprising how much can sometimes be done to improve an installation in this way at comparatively small cost.

## LIABILITY FOR FIRES.

The National Fire Protection Association has prepared a model bill which has been introduced in a number of state legislatures, placing a liability for any loss or damage created by fire upon the person whose negligence or non-compliance with any local or state law has been instrumental in causing the loss. This bill, if enacted into a law, would of course cover any damage from fires due to defective electrical installation, and would seem to place the responsibility upon the electrical contractor doing the work rather than upon the owner of a building, who might be entirely ignorant of the defective condition. This assumes, of course, that such defects are in contravention to a wiring code in effect in the given territory.

Certainly no objection to the enactment of such a law will be raised by the electric interests involved. Every reputable contractor endeavors to carry out his work in compliance with the Code and with any local electrical rules which may be in force, and the danger of liability from defects would only tend to make him more careful. On the other hand, this same liability would tend to discourage the incompetent from undertaking such electrical installation work and would make it a more serious matter for them to engage in it than it is at present. However, this goal seems to be reached in a more satisfactory way through the medium of a license which will be issued only to those who have shown themselves to be competent.

The National Fire Protection Association, which numbers among its members the National Electrical Contractors' Association, the American Institute of Electrical Engineers, and the National Electric Light Association, is urging this legislation because other means seem to have failed to check the excessive fire waste for which this country has achieved an unenviable reputation, and which appears to be largely due to the carelessness and indifference of the American people. If a legal liability for carelessness and negligence will achieve the desired end, it should certainly be welcomed by all.

## CHAIRMAN M'LEOD FORECASTS HIGHER ELECTRIC RAILWAY FARES.

At the annual banquet of the New England Street Railway Club a very suggestive utterance was voiced by Chairman McLeod of the Massachusetts Public Service Commission relative to the prospect of higher fares on trolley roads within the old Bay State. In an impromptu address Mr. McLeod referred to the Middlesex & Boston case of last fall as a turning point in electric railway rates and said that generally speaking, he was convinced that in the main the rates now charged are insufficient to enable the companies to give the kind of service the public has the right to demand, to adequately conserve the property and provide for depreciation. Return to capital was also recognized as a consideration not to be overlooked. There are at present at least three petitions before the Massachusetts Commission for authority to increase fares, and the indications are that most companies which are prepared to show their needs in this direction will be given more revenue at the hands of the board if they take the necessary steps.

Such an utterance is most significant in a state where honest management is common to all the properties and it sets an encouraging precedent for other states. The electric railway field is one of the greatest in the industry. It has been struggling for some years with the limitations of the 5-cent fare in face of rising costs of service, increasing taxation and more exacting demands on the part of the traveling public. Commissioner McLeod said that a board which sanctions increased rates has no popular task, and that is true; but he also showed that the interests of the public and the utility companies are identical in the long run, and went straight to the mark in pointing out that real service costs money; that it would be far better for the electric railways of the state to raise their rates and give such service than to fall into the condition of the Boston & Maine Railroad system, which is struggling to keep out of a receivership and once more get upon its feet financially. Every public-utility manager and every fair-minded observer of electric traction affairs must perforce applaud the courageous utterance of Chairman McLeod, which points the way to better days for deserving electric railways—an indication of brighter skies for the industry as a whole, taken in its broader significance.

## Associated Manufacturers of Electrical Supplies Organize Conduit Section.

At a meeting held in New York City on the evening of March 24, by the Board of Governors of the Associated Manufacturers of Electrical Supplies the by-laws of the newly formed Conduit Section were accepted. The officers of that section are:

Chairman, F. C. Hodkinson, Safety-Armorite Conduit Company.

Secretary, Alexander Loughlin, Jr., Central Tube Company.

Treasurer, D. Hayes Murphy, American Conduit & Manufacturing Company.

Executive Committee: F. C. Hodkinson, Alexander Loughlin, Jr., D. Hayes Murphy, C. E. Corrigan, Oscar Hoppe, Russell Dart and J. H. Trumbull.

The association members now constituting the Conduit Section are: Alphaduct Company, American Circular Loom Company, American Conduit & Manufacturing Company, Central Tube Company, Clifton Manufacturing Company, Eastern Flexible Conduit Company, Enameled Metals Company, Mark Manufacturing Company, National Enameling & Manufacturing Company, National Metal Molding Company, Safety-Armorite Conduit Company, Sprague Electric Works of General Electric Company, Trumbull Electric Manufacturing Company, Western Conduit Company.

All other conduit manufacturers in the United States are invited to join the association and become members of the section.

At the same meeting of the Board of Governors a portion of the Membership Committee was elected. Communications concerning membership should be addressed to W. C. Robinson, chairman of the Membership Committee, in care of National Metal Molding Company, Pittsburgh, Pa.

The temporary secretary, H. B. Crouse, presented proof copies of a booklet which very soon will be finished and ready for distribution. It contains the organization procedure, constitution and by-laws of the association. All manufacturers interested in the association may secure copies of that booklet by communicating with either H. B. Crouse, temporary secretary, care of Crouse-Hinds Company, Syracuse, N. Y., or A. W. Berresford, chairman of a Canvassing Committee which within the next few weeks will communicate with all those manufacturers of electrical supplies and materials entering into electrical construction whose addresses are known to the Canvassing Committee. Under Mr. Berresford's chairmanship other gentlemen have been asked to serve on the Canvassing Committee and from them data may be obtained. Those gentlemen are: C. L. Eidlitz, Metropolitan Electric Manufacturing Company, 1170 Broadway, New York City; W. F. Hessel, Detroit Fuse & Manufacturing Company, 114 Liberty Street, New York City; Harvey Hubbell, Bridgeport, Conn.; B. E. Salisbury, Pass & Seymour, Solvay, N. Y.; Walter D. Steele, Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.; Mr. Betts, of Thomas & Betts, 105 Hudson Street, New York City; H. I. Appleton, Appleton Electric Company, Chicago, Ill.; J. H. Parker, General Porcelain Company, Parkersburg, W. Va.; Frank E. Watts, Hart Manufacturing Company, New York City.

A report relative to the formation of a Wire and Cable Section was received by the Board of Governors. That all manufacturers of wire and cables may consider this subject together, the president of the association and LeRoy Clark, of the Safety Insulated Wire & Cable Company, New York City, were directed to invite all wire and cable manufacturers to convene in New York City, at the Biltmore Hotel, at 2:00 p. m., April 14. At that meeting the entire subject will be discussed. Prior to that meeting copies of the constitution and by-laws will be mailed to the wire and cable manufacturers. All of those who read this notice are asked to send their addresses to R. K. Sheppard, president of the Associated Manufacturers of Electrical Supplies, care of The B. F. Goodrich Company, Akron, O.

## Color in Lighting.

A very interesting address dealing with the physics of color was delivered by M. Luckiesh, of the Physical Laboratory, of the National Lamp Works, Cleveland, O., before the Chicago Section, Illuminating Engineering Society on the evening of March 25. Mr. Luckiesh chose for his subject "Color in Lighting," and illustrated his remarks with numerous lantern slides, showing the effect of color on lighting efficiency and also concrete examples of the principles of the spectrum. Mr. Luckiesh described several of his experiments in color work and referred briefly to "color music," which has been demonstrated recently in New York. This combining of a chromatic color score with orchestration is based on the analogy of color harmony to music harmony. Color effects are produced on a screen by lights of different color, controlled from the keyboard of the instrument.

The address was discussed briefly by A. O. Dicker, J. R. Cravath, Albert Scheible, F. A. Vaughn and C. A. Luther.

## New York Electrical Society.

The members of the New York Electrical Society at a meeting held in the Engineering Societies Building, New York City, on March 25, had an opportunity of making comparisons between two entirely different methods of illuminating big expositions when T. C. Martin, secretary of the National Electric Light Association, who is also a past-president of the society, made an address on "The Electrical Aspects and Lessons of the San Francisco Exposition." His remarks were based upon observations made during his recent visit to that city, but also included interesting facts concerning the system of illumination at the exposition now being held at San Diego.

By means of numerous lantern slides Mr. Martin was able to establish graphically a comparison of just what was being done in the way of lighting at San Diego where the practice of outlining the buildings with incandescent lamps is being followed out to some extent, with that at San Francisco where what is known as indirect or "flood" system converts the exposition into a veritable fairyland. Methods, good and bad, of exterior lighting of big buildings in cities were also shown and discussed.

Most of the interest, however, centered on the vivid descriptions of the marvellous electrical wonders shown nightly at the San Francisco Exposition, through the genius of the chief of the Department of Illumination, W. D'Arcy Ryan, and the description of the electrical effects which have obtained for the exposition the official title of the "Jewel City," made a strong appeal to the audience, which included a number of ladies. Some 60 colored lantern slides showed admirably the exquisite daylight beauty of the architectural features of the exposition, and included striking reflections of the buildings in the lagoons. The method of illuminating the towers, and the lighting of the interior of some of the buildings and courts was described in much detail, as well as the process by which the color effects are secured and which are projected on the various buildings by the powerful searchlights, representing some 2,600,000,000 candlepower. These excited the wonder of everyone present.

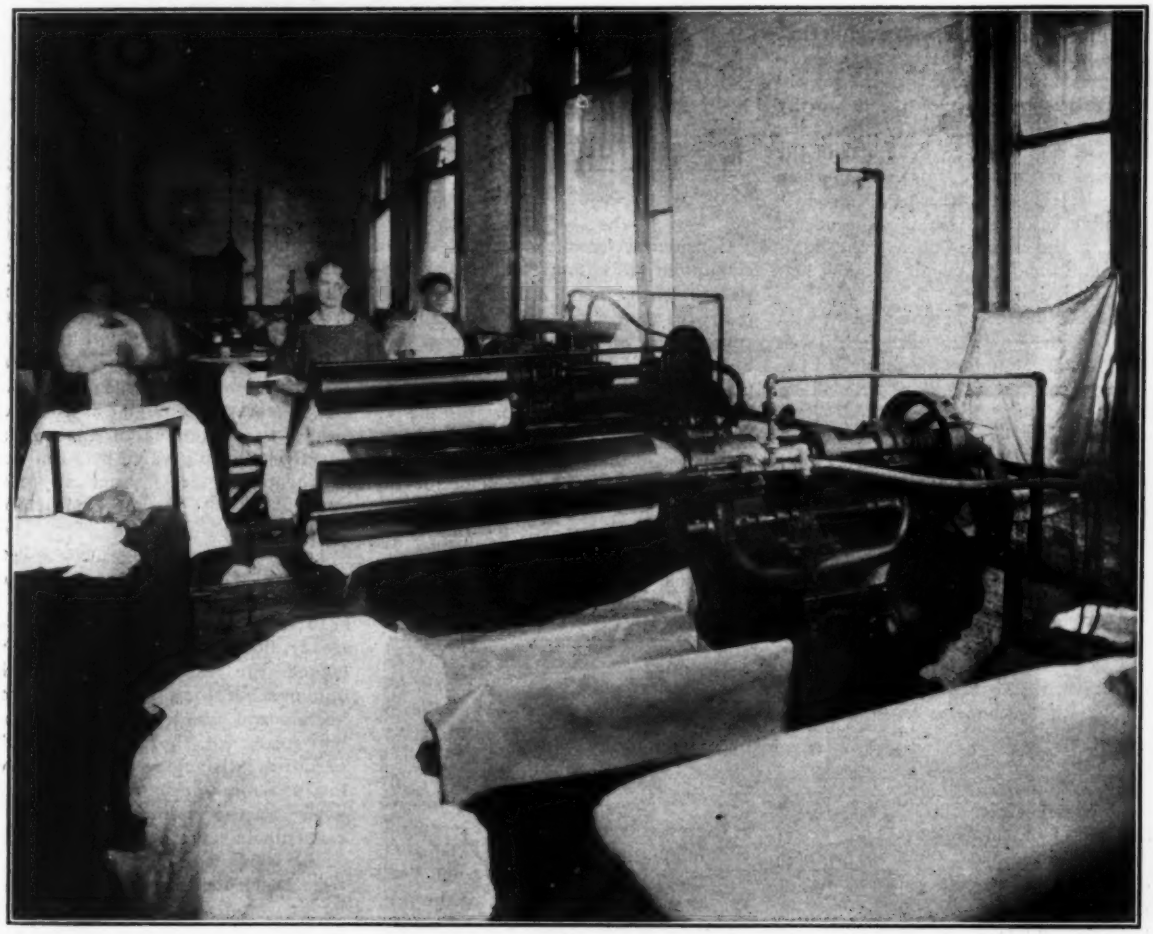
The lecturer also described fully the method of "indirect" lighting of the exterior of the buildings by means of lofty Venetian masts with colored semi-transparent shields, inclosing groups of three or five luminous arcs, according to the distance from the building. The 100,000 crystals on the Tower of Jewels were also described in detail and picturesque views of this tower were shown.

# Electricity in Laundries.

**This article comments on some of the advantages of electricity in the laundry and compares central-station power with isolated-plant operation. Details are given on a typical laundry plant using individual motor drive throughout.**

Laundry business has grown to be an important industry and the elaborate mechanical plants in use today are in great contrast to the hand equipments of a few years ago. In general the machinery in a modern laundry consists of washing machines, extractors, drying apparatus, mechanical sprinklers, starching machines, calenders or ironing machines, and special shaped machines used for sleeves, collars and cuffs and for finishing various classes of work.

The power rotary washing machine consists of an outer casing containing an inner horizontal cage in which the clothes are placed. The cage is rotated and reversed every few revolutions so that the clothes are rubbed and tumbled in the soap and water passing from the outer casing into the inner cage through perforations. The outer casing is provided with outlet and inlet valves for hot and cold water and for discharge and arrangements are generally made for admitting steam under pressure, so that the processes of washing, boiling, rinsing and bluing can be accomplished without removing the clothes.



Group of Mangles Driven by Individual Motors, Antiseptic Laundry, Chicago.

Hydro extractors are used to remove surplus moisture from the clothes. The wet garments are placed in a perforated basket supported on vertical bearings and revolving in an outer casing at about 1,000 to 1,500 revolutions per minute. At this range of speeds about 80 to 85 per cent of the moisture is removed from the clothes by centrifugal force. Drying rooms are made in a variety of forms but consist essentially of steam-heated compartments through which a current of air is forced by a fan. Mangles generally consist of polished metal rollers, heated by steam or gas, which work against a blanket of felted surface in the form of another roller or flat surface. Other forms of mangles consist of a felted roller rotating against a heated concave surface of polished metal. The description of the minor machines will be taken up later.

Laundries are particularly adapted to electric drive which has numerous advantages for such work. As female employees predominate the "safety first" argument is one of the principal ones, as by eliminating shafting and belting and using individual motor drive the danger of becoming entangled in the machinery is reduced to a minimum. Oil and dirt dropping from pulleys and belts is done away with; machines can be placed in the most convenient positions for sequence of operations; better light and sanitation are secured and the surroundings are made more cheerful.

There are numerous mechanical considerations to be thought of when equipping a laundry. The quality of the water is of great importance and complete water softening and filtration plants are frequently required. Soap making equipments are generally installed. A large tank for cold water is placed on the roof and a hot-water tank near the roof on the inside. A steel vat with steam connections and connections to the water tanks is frequently used for cooking the ingredients which consist of lye and tallow. Pumps are required for filling the tanks.

One of the most vital questions with which laundry proprietors have to deal is that of labor; particularly in the smaller cities does this question assume alarming proportions and any system which will improve the physical conditions, especially those which prevail during the summer months, is worthy of careful consideration. The reduction in noise, improvement in light and the absence of the dirt nuisance obtained with electric drive are sure to produce desirable results. Also the absence of shafting and belting improve the lighting conditions and permit of much better ventilation.

Another feature in connection with electric drive that, although well known, cannot be emphasized too strongly, is the absence of breakdown troubles.

Experience has shown that where motor drive is employed the delays, occurring so frequently in steam plants, are practically eliminated. The necessary expenditures for repairs is, therefore also very much less than where mechanical driven belting and shafting is employed.

Ironing Machine Driven by Motor.

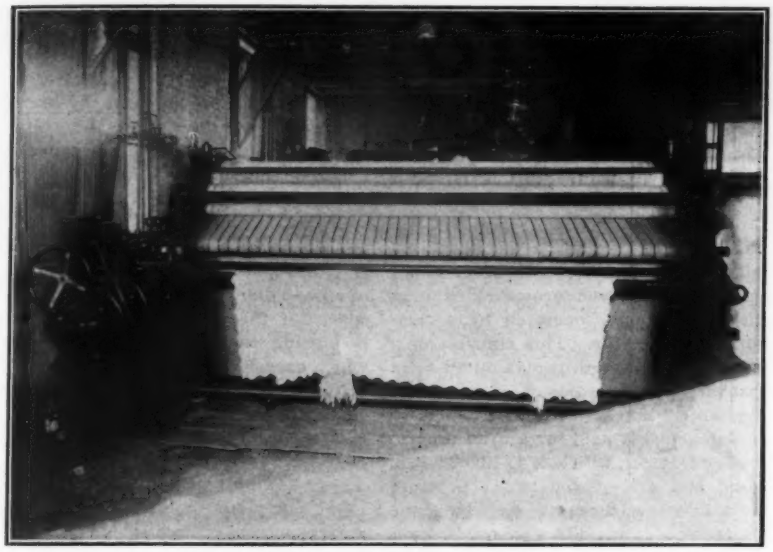
Considered from the central-station standpoint, all laundries offer possibilities for profitable business. In many instances large laundries requiring a considerable amount of steam can, with a well designed and efficient power plant, generate energy sufficient for their requirements at a cost too low to admit of central-station competition. Of course, if these laundries are so situated that it would be feasible for the central-station company to supply both steam and electric energy the above condition would not obtain.

Because heat as well as mechanical power is required for the complete cycle of operations, it is often argued by the laundry manager that the additional coal for sustaining sufficient boiler pressure to operate the engine is negligible when compared with the fuel needed solely to obtain steam for washers, dry rooms, mangles, starch cookers, etc., therefore the engine is considered to perform functions of a cheap and effective reducing valve between boiler and heating systems, practically generating at no cost the mechanical power required.

This contention may have value in those rather rare instances of a model plant where the mechanical drive has been installed, to show maximum efficiency, live-steam piping tight and well lagged, the exhaust carried with a minimum of back pressure to proper heaters and cookers as well as providing steam for those machines which permit a satisfactory operation at very low pressure—in short, in installations where all the engineering niceties and refinements have been carefully introduced, it might be doubtful if the change over to electric drive, with steam for heating alone, could be made to show an appreciable saving, judged exclusively from the standpoint of the coal pile.

However, after considering that the average small plant labors against serious wastes in boiler and engine room (incident to careless firing; leaky pipes and valves; wear and tear; decrease in production due to slippage of belts; danger of same to women operators; friction losses and bearing troubles accompanying long lines of shafting; dependence for continuous operation on one prime mover, and the greater time required for repairs should this single source of power fail) it is to be ques-

Group of Motor-Driven Machines at Antiseptic Laundry.



Motor Driving Heavy Mangle.

| No. | Horse-power | Kind of Drive | Application. |
|---|---|---|---|
| 1 | 0.75 | Gears | 36-inch American collar ironer |
| 1 | 1.5 | Group | Bishop edging machine, Floran seam dampener, Prosperity collar molder. |
| 1 | ⅛ | Gears | Bishop wristband starcher. |
| 1 | ½ | Gears | Adams collar dampener. |
| 1 | 1 | Gears—reversible motor | Bishop mist dampener. |
| 1 | 1 | Gears—reversable motor | Barnes & Erb bosom press. |
| 1 | 1 | Gears | Barnes & Erb bosom press. |
| 1 | 0.25 | Gears | American sleeve ironer. |
| 1 | 0.25 | Gears | Troy body ironer. |
| 1 | 1 | Belt | Fan for dry room, and blower for Bunsen burners on body ironers. |
| 1 | 0.75 | Gears | 20-inch starch extractor. |
| 1 | 3 | Chain | 24-inch by 120-inch Royal ironer. |
| 1 | 0.25 | Gears | Handkerchief ironer. |
| 2 | 0.75 | Belt | American dry room fan and chain. |
| 1 | 0.5 | Gears | American starching machine. |
| 1 | ⅛ | Belt | Singer sewing machine. |

tioned whether the coal-pile argument may not be justly relegated to a position of minor importance.

The greatest consideration must be given to these questions when figuring on the substitution of central-station service for private-plant power and much depends upon the ability of the power salesman to correctly analyze existing plant-operating expenses and fixed charges. Ability to do this readily and correctly will go far towards demonstrating definitely and convincingly to a prospect, the flaws and waste and general field for improvement in his power layout.

If such an engineering analysis shows that the cost of central-station service does not compare favorably enough with isolated-plants costs, all things considered, there are still many possibilities for securing good business. In many laundries the peak of the washing and ironing operations occurs simultaneously necessitating a much larger generating station at such times than is regularly required. Under such conditions laundries find it much more economical to purchase the extra power required and as the business increases the amount of purchased energy continually increases. In other establishments the washing or other departments must frequently operate overtime and the same situation as to excess power applies. Sign lighting, interior plant lighting, vehicle charging, etc., are other fields for central-station power in connection with the laundry industry.

The Antiseptic Laundry, located at Sheffield Avenue and Grace Street, Chicago, Ill., represents everything that is modern in equipment and aside from the wash room there is no belting nor shafting used, individual electric drive being employed entirely with the exception of one group of three small machines. When the proprietors, J. H. P. and A. F. B. Klein, started out to plan their building and contents electricity was decided upon and the present equipment includes not only motors but electric irons.

The laundry building proper is a two-story brick structure. The lower floor is devoted to checking, marking, and to the flat work, such as sheets, table cloths and pillow slips. The heating plant and wash room are in a single-story building adjoining the main building, forming an L-shaped structure. There is also a large two-story stable building. All of the buildings are lighted by tungsten-filament lamps. The wash room is supplied with power from a line shaft belted to an engine. It was decided not to use electric drive in this department owing to the severe service conditions at this particular plant. The washroom equipment consists of eight washers and three hydro-extractors.

The processes at the Antiseptic Laundry are typical of ordinary laundry work. The soiled goods are delivered by the wagon drivers to the first floor of the laundry where the checker sorts and tags them with the pin system. This consists of safety pins to which numbered tags are attached; they are re-

Motor Geared to Ironer.

moved before the clean laundry is sent out.

Clothes are first placed in wheel trucks and conveyed to the wash room and washed after which they are transferred to the extractors and thence to the dry room on the ground floor. This consists of an inclosed compartment heated with steam through which a current of air is forced by a fan driven by a one-horsepower motor. This motor also drives a blower that supplies air to the Bunsen burners on the body ironers. After drying the large pieces are run through a 24-inch by 20-inch Royal mangle operated through chain drive by a three-horsepower motor. The mangle has two steam-heated rollers held together under tension by compressed air. At maximum speed the mangle irons goods at the rate of 75 feet per minute and requires 12 girls to feed, fold, etc.

Laundry Machine Company, Chicago, Ill.

In laundering shirts, the soiled linen is first run through the washers and extractors on the ground floor and is then taken to a Watkins starching machine driven through gearing by a 0.5-horsepower motor. The shirt is next taken to a Watkins wrist-band starcher connected through gearing to a one-eighth-horsepower motor. The starch extracting and drying processes follow next in order. Shirts and other clothes are sprayed or sprinkled in a Bishop dampener operated by a one-horsepower motor. This consists of a galvanized tank with sprays on all sides that throw fine streams of water toward the center of the tank. The article to be dampened is held for a brief time in the spray after which it is placed in a wood box and placed under pressure from a screw press to distribute the moisture evenly. The cuff press, yoke

inch steam-heated iron cylinders and is driven through gearing by a 0.75-horsepower motor. The finishing operations on the collar are performed on a group of small machines driven by a 1.5-horsepower motor. First the collar's edges are moistened and smoothed on a Bishop edging machine after which turn-down collars are run through a seam dampener turned over by hand and placed on a Prosperity steam-heated collar molder which presses the edge of the collar, forms it and makes a space for the tie. The final operation is putting the collar through a form which consists of a hollow steam-heated cylinder. This operation gives the final shape suitable for the neck. The motor equipment is completed with a one-eighth-horsepower motor driving a Singer sewing machine for shirt repairing. Complete motor data are given in the accompanying table. All hand

Motor-Driven Extractor.

Motor-Driven Collar Ironers.

Adjacent to the mangle is a handkerchief ironer direct-connected to a 0.25-horsepower motor. Some of the pieces such as tablecloths and napkins require starching. A 20-inch starch extractor is provided in this department for removing the surplus starch and approximately 85 per cent of the moisture. It is geared to a 0.75-horsepower motor. For drying small pieces, a drying room is located on the second floor. There are two steam-heated compartments through which an endless chain passes at about five feet above the floor. Automatic clamps are attached to the chain which holds the clothes. A girl hangs the clothes on the chain on the right side out in the main room, they are carried through the two compartments in about 20 minutes and dropped automatically into baskets at the left side. The 20-minute trip is sufficient to dry the clothes. The chain is driven by a one-horsepower motor and the fan by a 0.75-horsepower motor. The dryer is known as a Watkins dry room and is manufactured by the American

press and neckband press are manually operated.

There are two Barnes and Erb bosom presses each driven through gearing by a one-horsepower reversible motor. The controllers are placed on the front side of the machines and have vertical handles that can be moved to the right or to the left, depending upon which direction it is desired to run the motor. The American sleeve ironers, two in number, are each driven by a 0.25-horsepower motor. Not only the sleeves of shirts, but sleeves of other garments are pressed on these machines. The Troy body ironer is driven by a 0.25-horsepower motor through gearing.

The first operations in the laundering of collars make use of the same machinery that is used for other articles, that is, washer, extractor, starching machine, starch extractor and dry room. After the collar is washed and dried it is run through an Adams collar dampener, driven by a one-third horsepower motor through gearing. It then goes to the collar ironer which has two 36-

ironing is done with seven-pound electric irons of which there are six with stands and boards. The average hours of work are 45 weekly.

## English Central-Station Extensions Held Up by War.

The British Treasury views with disapproval all extensions to electric supply undertakings which are not absolutely essential at the present time. If new consumers cannot be supplied from existing plants they have got to be told to wait until the war ends. This is part of the general scheme for preventing additions to municipal indebtedness when plenty of money will be needed for new war loans. The new Manchester station, which, as already mentioned in these columns, was to be begun almost immediately, is perhaps the biggest of such works to be deferred.

The Rideau Power Company is constructing a hydroelectric plant on the Rideau River at Merrickville, Ontario.

# Commercial Practice
# Management, Rates, New Business

## STREET LAMP INSPECTION AND MAINTENANCE IN SHEBOYGAN.

By Carroll H. Shaw.

Throughout this country electric street lighting greatly exceeds all other means of providing artificial illumination, but the methods adopted by the various lighting departments, of both municipal and private corporations for maintenance and inspection, vary from perfect maintenance to none at all.

The demands of the public for better street lighting are steadily becoming more insistent. The development of new systems of lighting is adding new, but, in general, less difficult, problems for the street-lighting department to meet; and as the importance of this service becomes more apparent, the quality improves.

Many companies, especially in smaller cities of 5,000 population or less, feel that the burden of high-grade maintenance is too great for the revenue received. In many instances this is the case, but it will be found that where good service is readily given, the public is far less liable to complain of the cost of that service than where both the price and the service are low.

It is the purpose of this article to describe the system of maintenance and inspection that is employed in a city of approximately 30,000 population. The ratio between the number of street lamps and the population will be found to be comparatively low when referred to other cities, but the size of the units will be found to somewhat offset this factor.

The fundamental purpose of the company in question is to give perfect service. There are three main factors that are considered; namely, outages of lamps, reliability of power, and appearance of lighting units.

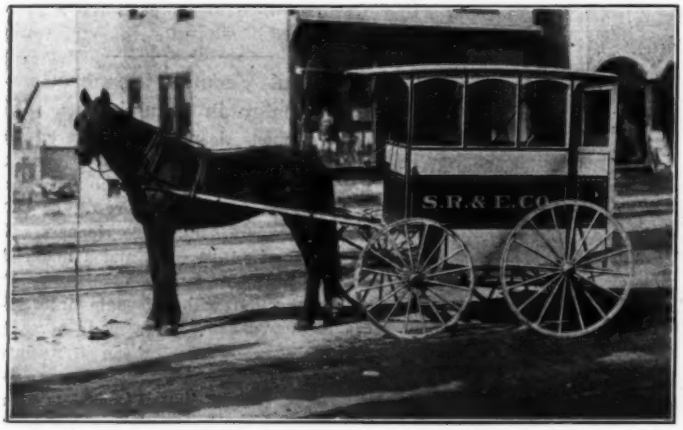
The subject of outages of lamps has, for many years, been an extremely difficult one to handle. The use of inclosed-carbon arc lamps rendered it practically impossible to give adequate service, for no one ever knew whether a lamp, even when newly repaired, would operate five minutes or five weeks. However, with the substitution, during the past year, of 600-candlepower Mazda lamps, it was felt that it would be practical hereafter to give almost continuous service with every unit.

With this end in view, the arc-lamp trimmer was provided with a specially designed wagon to be used exclusively for street-lamp maintenance. Two views of this wagon are shown herewith. In a forward compartment are carried at least six lamps and two glass globes. Under the seat there are ropes, blanket, cleaning cloths and cleaning compounds. At night, a lantern is carried inside, in addition to the wagon lamp.

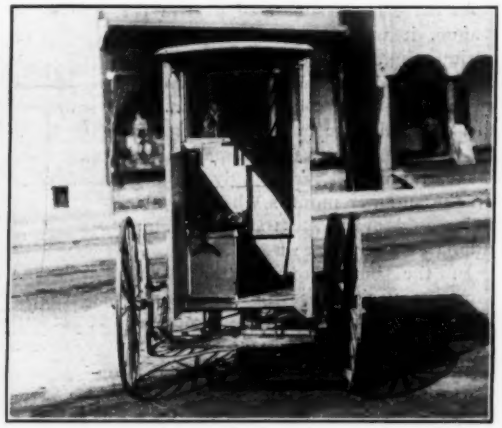
The inspector has for his most important duty the responsibility of keeping all lamps burning. He makes a complete inspection of every lamp every night, leaving the barn immediately after the circuits are turned on. There are 226 lamps distributed throughout the city and by means of properly laying out his route so that he drives only seven miles, he is able to see at least 425 lamps. This means that while he sees every lamp at least once, he sees some two or even three times. The covering of this route requires from two to three hours, depending largely on the weather.

In case a lamp is found not burning, he immediately installs a new one; a detailed record being kept of the time, location, and date of all replacements. The next day this report is transferred to a regular ledger.

In order that there shall be a minimum of outages due to defective wires, a most careful inspection of all fixtures, hangers, cross-arms, pins, and insulators is maintained. It is not generally appreciated that more than 75 per cent of the opening of street-series circuits occurs between the suspended lamp and the service pole. This is usually due to the fact that solid, or perhaps stranded copper, is used for this service. Either solid or stranded wire is too stiff to allow the lamp to swing freely and not eventually break the wire. For this reason, triple braid, flexible, weather-proof, B. & S. No. 6 copper cable is used exclusively and the very satisfactory results obtained




Wagon Used by Sheboygan Company in Lamp Maintenance Work.



Interior of Wagon Showing Tool Box and Compartment for Lamps.

more than justify the increased cost.

It has been found that any type of lamp hanger that depends on tensile strength of wooden hangers is not safe. Recently one of the lamps was found lying in the middle of the street on a calm night and an investigation showed that the wood strain insulator had broken off where a rivet had been inserted. Malleable-iron spaner-hangers have been found to be most satisfactory.

With the old type of arc lamps, it was very difficult to maintain a good looking fixture. Many of the reflectors came off and could not be replaced, and the inner globes after becoming etched by the action of the arc defied cleaning. With the installation of the Mazda lamps in new fixtures, it was realized that these difficulties had disappeared. Now the inspector cleans every lamp, outer-globe and reflector at least once a week. This means an average of 38 lamps a day and usually requires four hours. The time varies with the weather, location of the lamps, and the temperature.

As there is no source of heat in the wagon, it was found, after some experimenting, that during the winter, clear alcohol was the most satisfactory cleanser. It is cheap and easy to handle, and only one pint a week is used. At a cost of 60 cents a gallon this makes the daily expense only one cent. In the summer months when the alcohol would evaporate too rapidly, ammonia and water are used.

In the inspection of the Mazda lamps, a very interesting condition is discovered; namely, that practically all burn-outs occur soon after the lamps are turned on. Out of 173 burn-outs during the past six months, only 12 have been reported by the police. In order that the very highest service shall be maintained, the police are instructed to report direct to the office any outage that may be found before 9:00 p. m. When this is the case, the inspector replaces the burn-out immediately.

By means of these arrangements, no lamp can be reported as having been out "all night" by the police. This means that there is an almost negligible reduction in the payments for street lighting by the city.

The lamps are the 600-candlepower, 20-ampere type and are used in compensator-type fixtures. The service rendered is pronounced to be entirely satisfactory by the city authorities and absolutely no complaints are received.

The yearly load-factor of the central station at Durban, South Africa, is over 50 per cent, and the daily load-factor at some periods of the year is over 70 per cent.

## Kansas City Company Holds Electric Show.

The "Spring Festival Electric of Kansas City" was held at the Electric Shop of the Kansas City Electric Light Company, March 25 to April 3, with the leading supply houses represented with displays. The attendance during the week was very satisfactory. Among the new things shown was the Copeman automatic toaster, exemplified interestingly by a toaster five times natural size that by means of a tenth-horsepower motor turned a piece of wooden toast several times a minute, automatically. Miss Marie J. Russell, household utilities specialist of the light company, had charge of the festival. Decorations were Japanese in tone, with paper lanterns covering the lighting globes, artificial butterflies in the foliage, and singing canaries hidden, confined in small wooden cages. There was music mornings by an electric Victrola, afternoons by Kelly's orchestra. Each day had a demonstration of a particular utensil. Devices were sold at 20 per cent discount and on easy terms during the festival by all participating companies. The Electrical Contractors' Association of Kansas City distributed especially to persons whose houses were not wired, specially prepared blank books designed for record of shopping, containing the names of the members of the association, and the suggestion that the members maintained high standards in their work.

Take the "Blue" out of Monday
by Getting an Electric Washing Machine for Wifey
See them at the Electric Show
Kansas City Electric Light Co.

Advertisement Published During Show Week.

## Portland Company Publishes Weekly "Service" Bulletin.

The Portland (Ore.) Railway, Light and Power Company has inaugurated the publication of an attractive little pamphlet which it is planned to distribute to patrons of its street car and interurban lines. An issue of 50,000 will be published each week. The pamphlet deals in a good-natured spirit with the numerous problems involving "service" in all its phases. Included in the publication each week will be one page or paragraph entirely educational in character, dealing with investments, interests, taxes, operation, and, in a general way with what the company has done and is doing in the way of maintaining reliable service. The underlying aim of the publication, aside from its educational efforts, is summed up in the initial number as follows: "We are trying to start something you will enjoy, just to be sociable, mainly, but also so you will have something to read while the company carries you to and from work. And we are going to be cheerful about it."

A prize is being offered for a suitable name.

## Successful Vacuum Cleaner Campaign in Brooklyn.

The vacuum cleaner sale featured by the Edison Shop of the Edison Electric Illuminating Company of Brooklyn, has, up to March 24, shown a result of 275 vacuum cleaners sold. The cleaners sell at a price of $24.85 each, and a material profit is made by their sale.

In connection with this sale, interesting window displays were made at each branch office of the Edison Company, company billboards were used for attractive advertising, as well as the theater programs of the Brooklyn playhouses.

## Cost of Residence Service.

The Dayton Power & Light Company recently published an advertisement in the daily papers that is of exceptional interest, as it contained data on the actual cost of service in 1,000 residences during July and December. The advertisement bore the caption "Electric Light is Not Expensive," and contained the accompanying tabulated data taken from the company's books.

It is stated that many of the customers included in the tabulation use heating and cooking devices, in fact, the district covered is typical in every respect.

Monthly Electric Bills.

| Month | 60c and Less | 61c to 70c | 71c to 80c | 81c to 90c | 91c to $1.00 | $1.01 to $1.25 | $1.26 to $1.50 | $1.51 to $1.75 | $1.76 to $2.00 | $2.01 to $3.00 | $3.01 to $5.00 | $5.00 and Over |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| July ..... | 303 | 52 | 65 | 50 | 47 | 138 | 94 | 67 | 55 | 89 | 30 | 10 |
| December | 20 | 8 | 13 | 17 | 18 | 82 | 104 | 101 | 67 | 282 | 193 | 90 |

NOTE:—Figures in table designate the number of customers that paid the different amounts; for example, 303 customers paid 60 cents and less for July, 1914, and 104 customers paid between $1.26 and $1.50 for December 1914.

## Utilizing Monthly Bills to Obtain Leads for Salesmen.

By adding one inch to the width of the bills it sends out each month to all classes of its customers the Louisville Gas & Electric Company has developed a means of making it easier for any of these customers who are considering additional service to communicate with the commercial department. Robert Montgomery, manager of the commercial department, has just had the new forms of the bills printed, the extra inch extending across the top of the bill proper and across the stub which is perforated for detaching. These stubs are retained when the bills are paid at the windows or are included with a check when the customer settles through the mails. They then pass through the commercial department where inquiries are noted and assignments made up for the salesmen.

In the space above the bill proper, in black ink as is the rest of the bill and separated by a heavy line, is a statement calling attention to the advertising matter on the back of the bill and to the coupon in the inch space on the top of the stubs. The coupon is further emphasized by a hand which points in its direction and is in the usual form, with a series of squares in which the customer makes a cross to indicate in which particular service he is most interested. There is room for electric lights, electric power, and the various forms of gas service that are supplied and the statement on the other portion of the bill says that "complete information will be furnished" on any subject in which the customer indicates an interest by a cross mark. The customer is permitted to act on the belief that this will be in the form of literature sent through the mails, as many people will not ask for a salesman, but the "complete information" is to be carried by a salesman, who will at the same time seek to get a contract signed.

Mr. Montgomery, after considerable experience in using the backs of the bills sent out by the company to advertise the various services supplied by the company, finds that they get results with considerably greater efficiency and at very much less cost than has been true of the newspaper advertising, of which the company does a great deal.

## Street Lighting Improvement in Youngstown Temporarily Delayed.

In connection with the installation of the new street-lighting system in Youngstown, O., the Youngstown & Sharon Railway Company, which has the contract with the city, has been temporarily enjoined by the county authorities from placing poles for lights in front of the court house. This action was taken by the county commissioners for the reason that the court house has its own lighting plant, which supplies current to the ornamental lights in front of the building, and the contention is that the city lights are therefore not only not needed, but that they will interfere with entrance and exist at the court house.

## A Safety Device for Arc Lamp Trimming.

In its efforts to carry out the spirit of the "Safety First" slogan, the Minneapolis General Electric Company has originated an interesting little device for the use of arc-lamp trimmers. It consists, as may be seen in the accompanying illustration, of a non-collapsible tripod with a projecting stem to which are attached two signal wings

Safety Signal Used When Trimming Lamps.

at right angles. On the wings are painted red circles on a white background. The stem extends over the wings and is bent into a small circle, so that when the trimmer is moving from place to place he has but to drop it over a hook provided for that purpose on the rear of his wagon.

When the workman is about to trim a lamp on a busy street he first places the tripod on the ground at the point where the lamp is to descend. Then he may lower his lamp without fear that a passing vehicle will dash under it at a time, perhaps, when it is just low enough to be caught and broken. Sometimes the glare of the sun will prevent an otherwise careful driver from seeing an ascending or descending lamp that is several feet above the ground, but not high enough to be safe from being hit. The company's officials say this little danger stand is useful not only in eliminating the chance element that results in accidents, but it relieves the workman of the need of exercising vigilance that would otherwise be necessary.

## Increase in Power Business in Cleveland.

Since January 1 of this year, the Cleveland Electric Illuminating Company has closed power contracts representing a connected load of 11,650 horsepower. Included among these are two steel-mill installations, one for the Empire Rolling Mill and one for the Union Rolling Mills, each of which will be 2,000 horsepower capacity. These installations under normal conditions will operate 24 hours per day. Among other contracts closed, are the White Company, about 3,000 horsepower, connected in light and power, the Nungesser Electric Battery Company, 1,000 horsepower, the American Stove Company, 400 horsepower, the New England Company, 800 horsepower, The Ames Company, 400 horsepower.

The company has been carrying on a newspaper advertising campaign to interested power users, publishing testimonials of satisfied power customers. This campaign, it is believed, has been of great benefit to the power salesmen.

## Central-Station Troubles from Scarborough Bombardment.

The Scarborough (England) Electric Supply Company, which lost its secretary in the bombardment by the Germans, also found that about two hundred of its electricity consumers shut up their houses and "bolted.' Access to meters for readers was a matter of difficulty. Circulars were sent out asking these consumers to send their keys or else to indicate where they were. Twenty took no notice. The chairman of the company says that the town suffered more from its own refugees than it did from the bombardment.

## Easter Display in Brooklyn.

In connection with the Eastern window display at the Bedford office of the Edison Electric Illuminating Company of Brooklyn, an electrical incubator is displayed. Thirty-seven leghorn eggs have been hatching in this incubator for the past three weeks, the hatching of the eggs being dated to take place between Good Friday and Easter Sunday.

## Brooklyn Edison Company Replaces Steam Plant on Dry Dock.

The Furman Dry Dock Company, occupying docks and repair shops at 268 Conover Street, Brooklyn, has replaced its 200-horsepower steam-engine plant with motor-driven installation supplied from the mains of the Brooklyn Edison Company.

# Electrical Construction

## NATIONAL ELECTRICAL CODE AMENDED AT CONFERENCE IN NEW YORK CITY.

### Biennial Meeting of Electrical Committee.

The regular biennial revision of the National Electrical Code took place at a series of meetings of the Electrical Committee of the National Fire Protection Association held in New York City March 22 to 25. The Electrical Committee held meetings on Monday and Tuesday to consider suggested changes in the Code and to go over the reports of the various sub-committees. On Wednesday and Thursday, March 24 and 25, meetings open to the public were held in the auditorium of the New York Board of Fire Underwriters, at 123 William Street, and the recommendations of the Committee were considered. Chairman F. E. Cabot presided at these meetings, and the secretary of the Committee, Ralph Sweetland, presented to the meeting the action of the Electrical Committee upon such matters as were contained in the bulletin issued by the Committee on February 15, the important portions of which were printed in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, February 20, 1915.

The subjects giving rise to most debate during the meeting were in connection with refillable fuses and insulating joints. The Electrical Committee had substituted for the report of the Switch and Cutout Committee a statement recommending further trial of refillable fuses and the accumulation of more field experience. This gave rise to considerable debate in the meeting.

H. R. Sargent opposed extending the experimental period for such fuses, as he contended that they were unsafe; that this had been fully demonstrated, and that there was no occasion for further experiment.

A. L. Eustice claimed that experience of three years with these fuses did not substantiate Mr. Sargent's contentions, and that the abuse of other forms of fuse already existed, and in quite as marked a degree as could ever occur with the refillable type.

H. O. Lacount, chairman of the Switch and Cutout Committee, stated that the attitude of the Committee was entirely neutral in this matter.

The substitute report of the Electrical Committee was, however, defeated, and the original report of the Switch and Cutout Committee referring to this matter was adopted, as follows:

It is the opinion of the committee that experience has not yet shown that fuses in which the fuse element is intended to be replaced or renewed by the user are satisfactory in test or in field service to a degree warranting the recognition of the principle of refillable fuses in the rules of the National Electrical Code.

The representatives of the Economy Fuse Company thereupon raised a question as to the status of the meeting then being held and who it was that was supposed to carry on the revision of the Code. Chairman Cabot stated that it was a meeting of the public interested in the subject.

The debate on insulating joints arose from the proposal to discontinue the requirement for their use in straight electric fixtures. The Electrical Committee recommended the adoption of this amendment. It was opposed by the representatives of several manufacturers, who pointed out that a great deal of expense had been incurred by them in preparing to meet the requirements of the previous Code provisions, and that it was not fair to them to suddenly eliminate this requirement of the Code, without due notice. The general debate which followed showed that there was not unanimity of opinion as to the desirability of grounding the fixture, and that the advisability of adopting this amendment was questionable. It was finally referred back to the Committee for a report at the next revision of the Code, at which time there seems considerable likelihood of its adoption.

A provision in the report of the Committee on Fixtures, reducing the test voltage to be applied between the screw connection and the exterior metal casing of insulating joints from 4,000 to 3,000 volts, was opposed by representatives of two manufacturers upon similar grounds. This change, however, was adopted.

One innovation in the Code which was adopted was the discontinuance of detailed rules covering rubber-covered wire, cabinets, fixtures, and insulating joints. The next edition of the Code will contain only skeleton outlines of the provisions covering these articles, and separate pamphlets will be printed in which all details will be incorporated.

The first public session was called to order at 10:10 a. m. on Wednesday, March 24, the auditorium being filled to its capacity and a portion of the audience being able to secure only standing room.

Of the changes in the Code recommended by the Electrical Committee at its meeting on April 1, 1914 (see ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, February 20, 1915, page 337), the following were adopted:

Rule 8*c* was changed to permit fuses of 10-ampere capacity instead of 6-ampere capacity.

Rule 50, heading of table on page 96 was changed to read "0 to 600 volt classes."

A statement is to be incorporated in the Code, to the effect that link-fused rosettes are only approved for use in large mills.

No action was taken with respect to varnished-cambric cable nor on the proposed amendment to Rule 70*a*.

Of the Committee opinions, as given in full on page 337 (see above), the paragraphs on fuses in multiple, and junction boxes in attics were adopted.

The reports of committees were then taken up. The report of the Committee on Transformers as given in the bulletin was changed.

Rule 81*a* was changed to read as follows:

**Construction.**—Must be placed in substantial metallic or other noncombustible cases, which completely inclose all current-carrying parts, with the exception of the terminals of the low-voltage windings, as specified below. Sheet-metal cases must be of not less than one-thirty-second inch in thickness and cast-iron cases must be of not less than one-eighth inch in thickness.

Must be so constructed that where mounted on a plane surface the casing will make contact with such surface only at the point of support. An air space of at least one-fourth inch between the transformer casing and the supporting surface will be required.

Leads of approved cable at least six inches in length and so secured as to prevent strain coming on the connections to the coils, must be brought out of the case through approved insulating bushings, except for bell-ringing and toy transformers, the low-voltage terminals of which may be binding posts mounted on the case.

The construction throughout must be substantial and thoroughly workmanlike.

The fine-print note at the beginning of Rule 81 was amended by adding at the end the words "nor to instrument transformers."

The paragraphs on air-cooled trans-

formers and bell-ringing or other signaling transformers were adopted as printed, with but minor changes in wording. The proposals regarding toy transformers were referred back to the Committee with power to act, objections having been made to the temperature limit set for operation on short-circuit.

The report of the Commitee on Rubber-Covered Wire was presented and adopted, as follows:

**Rubber-Covered Wire.**

Rule 26*g*. "Must have an *approved* rubber (Type Letter RS for wires smaller than No. 6 B. & S. gauge and Type Letter R D for wires No. 6 and larger)," etc.

Rule 26*n*. "Must have approved rubber insulating covering and must, within the conduit tubing, be without splices or taps.

"Must be double-braided (Type R D) for twin, twisted-pair or multiple-conductor cables and for all single conductor of No. 6 B. & S. gauge and larger."

Rule 50*h*. "All of the above insulations must be protected by a substantial braided covering and for all single-conductor No. 6 B. & S. gauge and larger there must be, in addition, a second outer fibrous covering at least one-thirty-second inch in thickness. The above covering must be properly saturated with a preservative compound. These coverings," etc.

Rule 56. Heading "Including Type Letter R. D."

Rule 56*a*. "Single conductors for conduits must comply with the requirements of No. 50. For single conductors No. 6 B. & S. gauge and larger there must be a second outer fibrous covering at least one-thirty-second of an inch in thickness (tape may be substituted for the inner braid). This fibrous covering," etc.

Rule 57*a*. Change R D to R S in table for single-conductor cable 14, 12, 10 and 8.

Rule 83*e*. End first sentence with word "gage."

It was decided to print in the Code only a skeleton of the requirements for rubber-covered wire, the complete specifications and methods of test to be published separately, as prepared by the Committee. The Committee was also empowered to make any other changes necessary to make the Code conform throughout with the changes adopted.

The report of the Committee on High-Potential Pole Lines was then taken up.

No change was made in Rule 13.

Rule 12*m* was changed to read as previously printed (see page 337, issue of February 20).

The first paragraph of Rule 12*b* was amended to read as follows:

Line wires must be so placed that moisture can not form a cross connection between them; must be not less than one foot apart except when in conduit, or in the form of multiple-conductor cable; must not be in contact with any substance other than their insulating supports. Multiple-conductor cables must be secured to strain insulators spaced not less than one foot from any adjacent woodwork and in turn secured to petticoat or strain insulators by strain wires.

Rule 17*d* was changed to read as follows:

No underground service from a subway to a building, and no service from a private generating plant shall supply more than one building, except by special permission, unless the conductors are properly protected by fuses and are carried outside all the buildings but the one served. Conductors in conduit or duct buried under two inches of concrete under a building, or buried back of two inches of concrete or brick within a wall, are considered as lying outside of the building. These requirements do not apply to factory yards and factory buildings under single occupancy or management.

**Theater Wiring.**

The report of the Committee on Theater Wiring was adopted as previously printed. Rule 38*k* was amended to require arc lamps to be constructed of metal of thickness not less than gauge No. 20. Rule 38*u* 7 was amended by striking out the words "properly ventilated" and adding the following:

Ventilation for permanent booths must be provided by means of a vent pipe having a cross section of not less than 78 square inches; said pipe leading to the outside of the building or to a special non-combustible vent flue. All parts of vent pipe to be at least one inch from any combustible material or separated therefrom by means of approved non-combustible heat-insulating material not less than one-half inch in thickness.

A fan capable of exhausting fifty cubic feet of air per minute shall be installed and arranged in such a way, that gas and smoke passing through the vent flue shall not come in contact with the motor. The motor must be connected to the emergency service and must not be controlled from the booth.

All openings into this booth must be arranged so as to be entirely closed by doors or shutters constructed of the same or equally good fire-resisting material as the booth itself. Doors or covers must be arranged so as to be held normally closed by spring hinges or equivalent devices."

Rule 38 *v* is amended to read as follows:

*v. Moving-Picture Equipments of Approved Miniature Type for Home, Lecture and Similar Purposes.*

1. All equipments must be expressly approved, and such approval must cover the entire machine including all attachments, current-controlling devices and other parts employed, including also the film.

2. The entire equipment must consume not more than 660 watts.

3. Arc lamps must be constructed so far as practicable in accordance with the requirements of No. 38*k*, 1, 2, 3, 4 and 6, and incandescent lamps must be suitably inclosed. In either case the inclosure must be so ventilated or guarded that no outside exposed surfaces will attain a temperature exceeding 250 degrees Fahrenheit under conditions of continuous service.

4. Rheostats, transformers, switches and other similar current-controlling devices must be attached to and form a part of the machine, must have no live parts exposed, and must comply with the requirements of No. 65 and No. 78 or No. 81 *a, b, c*.

5. Films must be of an approved slow-burning type having a permanent distinctive marker.

6. Machines must be so constructed that they cannot be used with films employed on the full-sized commercial moving-picture machine. This may be accomplished by using a film of special width or with special perforations or by any other approved means.

*Note.*—The regular film which is not allowed on miniature machines is 1⅜ inches wide and has on each edge 5.4 perforations per inch.

7. Machines must be marked with the name or trademark of the maker, and with the voltage and current rating for which they are designed, and be plainly marked, "For use with slow-burning films only."

**Gas-Filled Lamps.**

The report of the Committee on High-Wattage Lamps was changed before adoption. Rule 35, covering this subject, was made to read as follows:

*a*. Must be so grouped that not more than 660 watts (nor more than 16 sockets or receptacles) are to be dependent on one cutout, except that in cases where wiring equal in size to No. 14 B. & S. gauge is carried directly into keyless sockets or receptacles, the location of which is such as to render unlikely the attachment of flexible cords thereto, the circuits may be so arranged that not more than 1,320 watts (or 32 sockets or receptacles) will be dependent on the final cutout. Where a single socket or receptacle is used on a circuit the limitation of watts permissible on the final cutout shall be the maximum capacity for which such socket or receptacle is approved.

*b*. Must not be used in show windows or in other locations where inflammable material is liable to come in contact with lamp equipment except where used in connection with approved fixtures where temperature of any exposed portion of same does not exceed 200 degrees Fahrenheit (93 degrees centigrade).

*c*. Must not be used in connection with medium-base sockets or receptacles if of above 200 watts nominal capacity nor with Mogul-base sockets or receptacles if of above 1,500 watts capacity. Must not, if provided with a shade, reflector, fixture, or other inclosure above the socket be used in fiber-lined metal-shell or similar sockets or receptacles of either medium or Mogul-base types if of above 100 watts.

*d*. Fixtures within buildings must be wired with conductors of approved slow-burning insulation or asbestos covering where the temperature to which wire is subjected at any point exceeds 120 degrees Fahrenheit (49 degrees centigrade). Where fixtures are placed outside of buildings, approved rubber-insulated wire is required.

The report of the Committee on Variable-Speed Motors was adopted. The fourth paragraph of Rule 8*b* now reads as follows:

The current used in determining the size of varying- (or variable-) speed

motor leads or branch circuits must be the percentage of the 30-minute current rating of the motor as given for the several classifications of service in the following table:

| Classification of Service | Percentage of current rating of motor |
|---|---|
| Operating valves, raising or lowering rolls | 200 |
| Rolling tables | 180 |
| Hoists, rolls, ore and coal-handling machines | 150 |
| Freight and passenger elevators, shop cranes, tool heads, pumps, etc | 120 |

Fine-print note same as present.

In the second paragraph of Rule 8*h* strike out the words "alternating current."

The report of the Committee on Induction Motors was adopted. The second paragraph of Rule 8*b* was amended to read:

Motors operating at a potential between 550 and 3,500 volts must, except in central or substations, be wired with approved multiple-conductor, metal-sheathed cable in approved metal conduit. All apparatus and wiring connected to the high-tension circuit must be completely inclosed in substantial grounded metal shields or casings and the conduit must enter and be properly secured to such casings or to suitable terminal boxes screwed or bolted to the casings.

Amendment to present fifth paragraph of Rule 8*b:* In third line change words "at outlets" to "of cables."

The first sentence of the third paragraph was changed to read:

Wire carrying the current of only one motor must be designed to carry a current at least 25 per cent greater than that for which the motor is rated.

The fourth paragraph was amended to read:

The current used in determining the size of wire carrying the current of only one varying speed alternating current motor must be the percentage of the 30-minute rating of the motor as given for the several classifications of service in the following table.

The last paragraph of Rule 8*c* was amended and a fine-print note added as previously printed. Rule 23*e* was amended to conform.

The Report of the Committee on Construction of Sockets was then presented. The following changes in the Code were adopted:

Change heading to read "72. *Sockets and Lamp Receptacles*" and omit fine print.

Omit ratings in Rule 72*a*.

Change third paragraph in Rule 72*e* to read as follows:

In pendent sockets there must be sufficient room in the cap for a knot in the cord without crowding. All parts of the cap upon which the knot is likely to bear must be smooth and well insulated.

Change Rule 72*h* to read as follows:

The parts to which wiring connections are made must be designed to securely grip the conductors. An upturned lug or some equivalent arrangement must be provided to hold the wires under the screw heads.

In Rule 72*p* the first paragraph was not changed, but the fine-print note was discarded and the second paragraph made to read as follows:

Lead wires furnished as a part of sockets and intended to be exposed after installation must be of *approved* stranded, rubber-covered wire, not less than No. 14 B. & S. gauge (No. 18 B. & S. gauge for candelabra sockets), be sealed in place and spaced at the point of entrance to the shell a distance of one-quarter inch in the clear from each other, or from exterior metal parts of the socket.

The changes proposed in Rules 23 and 31 were not adopted.

The change recommended by the Committee on Electric Heaters in Rule 25*d* was not adopted.

### Grounding Conduit.

The report of the Committee on Grounding of Conduit, as formerly printed, was changed.

Rule 12*f* has new paragraphs added, as follows:

Metal conduits containing service wires must be insulated from the metal conduit, metal molding, or armored-cable system in the building, and all metal work on or in the building; or they must have the metal of the conduit permanently and effectually grounded to water piping, gas piping, or other suitable grounds; provided that when connections are made to gas piping, they must be on the street side of the meter, this ground connection to be independent of and in addition to any other ground wire on metal conduit, metal molding or armored cable within the building.

If conduit, couplings or fittings having protective coating of non-conducting material such as enamel are used, such coating must be thoroughly removed from threads of both couplings and conduit, and such surfaces of fittings where the conduit or ground clamp is secured in order to obtain the requisite good connection. Grounded pipes must be cleaned of rust, scale, etc., at place of attachment of ground clamp.

Connections to grounded pipes and to conduit must be exposed to view or readily accessible, and must be made by means of approved ground clamps to which the ground wire must be soldered.

Ground wires must be of copper, at least No. 6 B. & S. gauge (where largest wire contained in conduit is not greater No. 0 B. & S. gauge), and need not be greater than No. 4 B. & S. gauge (where largest wire contained in conduit is greater than No. 0 B. & S. gauge). They shall be protected from mechanical injury.

Add fine-print note:

The ground on the conduit system is not to be considered as a ground for the secondary system (see No. 15).

The Report of the Committee on Hard-Rubber Bushings in Sockets was then taken up. The following changes in the Code were adopted.

Rule 72*q* to read as follows:

When the socket is not attached to a fixture, the inlet, if threaded, must be provided with a strong insulating bushing. The edges of the bushing must be rounded and all inside fins removed, so that in no place will the cord be subjected to the cutting or wearing action of sharp edges. Bushings for sockets having threaded outlets should have a hole not more than seven-thirty-seconds inch in diameter for pendent cord or thirteen-thirty-seconds inch for approved reinforced cord.

A new section is added to Rule 31, as follows:

When the socket is not attached to a fixture, the inlet if threaded must not be less than ⅜ inch pipe size, and must be provided with an approved insulating bushing.

A new section is added to Rule 32, as follows:

Must where passing through covers of outlet boxes be protected by approved bushings especially designed for this purpose. So-called hard-rubber or composition bushings threaded into box covers must not be used.

The report of the Committee on Garages was adopted substantially as originally printed, except that the new rule was made to apply only to garages for two or more vehicles. A fine-print note was added at the end of this rule, stating that the provisions do not apply to garages used only for electric vehicles.

The report of the Switch and Cutout Committee was adopted, amending Rule 19*a*, as printed.

The second paragraph of Rule 19*a* was amended by striking out everything after the words "short-circuits" in the fifth line.

Rule 65*k* was amended by adding the following paragraph, immediately following Table 5.

Where barriers of approved design and made of suitable non-absorptive, non-combustible insulating material or of impregnated hard wood are placed between parts of opposite polarity the minimum separation of these parts on switches described in Table 5 may be that given in Table 4.

A statement regarding refillable fuses, as already given above, was adopted.

The report of the Committee on Cabinets was adopted and referred back to the Committee, with power to make minor changes in the wording.

It was also decided that only a skeleton of the provisions covering cabinets be printed in full in the Code, and that a separate pamphlet covering the details be printed.

At the afternoon session the report of the Committee on Fixtures, recommending changes in Rules 24*e*, 26*v*, 30, 77*a*, 77*b*, 77*c*, 77*d*, 77*e*, 76*a* to *j*, was adopted and portions of these rules referred back to the Committee for changes in wording, with power to act. This portion of the Code will also be abridged.

The report of the Committee on Safety to Life was adopted only in part.

Rules 1*c*, 8*a* and 2*a* were adopted as previously printed.

Rule 3*a* was changed so that the last sentence reads as follows: "The space back of the board must be kept clear of rubbish and must not be used for storage."

Rule 8*f* was changed to omit the requirement for a waterproof cover.

Rule 11*b* was changed as previously printed.

Rule 12*c* was changed as previously printed.

Rule 12*h* was changed by adding the words "approximately every 500 feet."

It was decided to substitute a fine-print note for Rules 20, 21 and 22.

In Rule 23*a*, third paragraph, the word "may" was changed to "must." This forbids the use of a fuse in the neutral wire of a three-wire system.

Rule 26*e* was changed to require protection on side walls extending not less than seven feet from the floor.

The first paragraph of Rule 32*d* was changed as previously printed.

Rule 26 was changed as previously printed.

In the last line of the last paragraph of Rule 32*d*, the word "wire" was stricken out.

Rule 32*g* was changed to read "must be connected to all fittings so that strain is taken from the joints and binding screws."

In Rule 38*h*, the word "ironclad" in the first line was changed to "inclosed."

The report of the Committee on Grounded Concentric Wiring Systems, as printed in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, February 6, 1915, was withdrawn, and a substitute report submitted stating that the report of a committee appointed by the Associated Manufacturers of Electrical Supplies had been received, and requesting the co-operation of that organization in future consideration of this subject.

Laboratory reports were then taken up, but only two of the suggested changes were adopted, as follows:

Rule 65*i* was changed to read:

Must operate successfully at 50 per cent overload in amperes, and at rated voltage under the most severe conditions with which they are liable to meet in practice.

The fine-print note in Rule 71*h* was changed to read:

When link fuses are used the test shall be made with mounting screws in position, and grounded, and with loose cotton placed about the device. The fuse wire should melt at about seven amperes in one-inch length. No destruction, arcing or inoperative conditions should result after six tests on the same sample.

**Miscellaneous.**

Of the many suggested changes to the Code submitted by various individuals and printed in the advance bulletin of the Electrical Committee, already referred to, but a small proportion received favorable recommendation by the Electrical Committee or favorable action by the meeting. The following amendments to the Code were adopted:

In Rule 4*b*, second paragraph, eighth line, the word "candlepower" was changed to "wattage."

The wording of Rule 8*c* was changed slightly.

Rule 16*b* was changed by omitting the third sentence, requiring solid knobs at the end of runs.

Modifications were made in table of Rule 18*a*.

A proposed amendment to Rule 19*a* was referred to the Committee on Grounding of Low-Potential Systems, with power to act. Similar action was taken with reference to a proposed amendment to the first paragraph of Rule 23*a*.

The second paragraph of Rule 23*a* was amended to read as follows:

Where the switch required by Rule 24*a* is inside the building, the cutout required by this section must be placed so as to protect it, unless the switch is of the knife-blade type and inclosed in an approved box or cabinet, under which conditions the switch may be placed between the source of supply and the cutout.

Rule 23*d*, sixth paragraph, was amended to include signs.

Other proposed changes in Rule 23*d*, third paragraph, were referred to the Committee, with power.

The second paragraph of Rule 23*f* was amended to read as follows:

Circuit-breakers will be approved for circuits having a maximum capacity greater than that for which approved enclosed fuses are rated.

The following sentence was added to the second paragraph of Rule 24*a* "Service switch must indicate plainly whether it is open or closed."

An amendment to Rule 24*d* reading as follows: "Wherever receptacles are located in floors, outlet boxes especially designed to afford protection from moisture or mechanical injury shall be provided," was referred back to the Electrical Committee, with power to change the wording and insert in the Code.

The same action was taken in regard to the following proposed amendment to the same rule:

Where flush switches or receptacles are used, whether with conduit systems or not, they must be inclosed in an approved box constructed of iron or steel, in addition to the porcelain inclosure of the switch or receptacle. Where attachment plugs and receptacles are installed in floors, of any building except a residence, they must be inclosed in floor outlet boxes especially designed for this purpose. Where attachment plugs and receptacles are installed in floors of a residence they must be inclosed in an *approved* box constructed of iron or steel, in addition to the porcelain inclosure of the receptacle (see first sentence of this section). Floor outlet boxes may be used; their use is permitted but not required.

The reference in Rule 25*b* to Rule 54*d* was changed to read "54*l*."

Rule 26*a* was changed to read as follows:

When entering cabinets, cutout boxes or junction boxes, except in conduit, armored-cable or metal-molding work, must be protected by non-combustible, non-absorptive insulating bushings, which fit tightly the holes in box and are well secured in place. The wires should completely fill the holes in the bushings so as to keep out dust, tape being used to build up the wires if necessary. For concealed knob and tube work, or for open work in dry places, approved flexible tubing will be accepted in lieu of bushings, providing it extends from the last porcelain support into a wooden cabinet, or is secured to a metal cabinet or junction or switch box by an approved fitting.

Rule 26*l* was changed so that the last sentence should read as follows:

No single circuit of more than 1,320 watts shall be used in metal molding, and not more than four No. 14 B. & S. gauge rubber-covered wires shall be placed in metal molding.

A paragraph was added to Rule 26*n*, reading as follows:

Slow-burning insulation may, however,

**Table to Constitute Rule 28i.**

SIZE OF CONDUITS FOR THE INSTALLATION OF WIRES AND CABLES.

NUMBER OF WIRES IN SYSTEM.

| Size B. & S. | One Conductor in a Conduit. Electrical Trade Size of Conduit, inches. | Two Conductors in a Conduit. Electrical Trade Size of Conduit, inches. | Three Conductors in a Conduit. Electrical Trade Size of Conduit, inches. | Four Conductors in a Conduit. Electrical Trade Size of Conduit, inches. |
|---|---|---|---|---|
| 14 | ½ | ½ | ½ | ¾ |
| 12 | ½ | ¾ | ¾ | ¾ |
| 10 | ½ | ¾ | ¾ | 1 |
| 8 | ½ | 1 | 1 | 1 |
| 6 | ½ | 1 | 1¼ | 1¼ |
| 5 | ¾ | 1¼ | 1¼ | 1¼ |
| 4 | ¾ | 1¼ | 1¼ | 1½ |
| 3 | ¾ | 1¼ | 1¼ | 1½ |
| 2 | ¾ | 1¼ | 1½ | 1½ |
| 1 | ¾ | 1½ | 1½ | 2 |
| 0 | 1 | 1½ | 2 | 2 |
| 00 | 1 | 2 | 2 | 2½ |
| 000 | 1 | 2 | 2 | 2½ |
| 0000 | 1¼ | 2 | 2½ | 2½ |
| CM. | | | | |
| 200000 | 1¼ | 2 | 2½ | 2½ |
| 250000 | 1¼ | 2½ | 2½ | 3 |
| 300000 | 1¼ | 2½ | 2½ | 3 |
| 400000 | 1¼ | 3 | 3 | 3½ |
| 500000 | 1½ | 3 | 3 | 3½ |
| 600000 | 1½ | 3 | 3½ | |
| 700000 | 2 | 3½ | 3½ | |
| 800000 | 2 | 3½ | 4 | |
| 900000 | 2 | 3½ | 4 | |
| 1000000 | 2 | 4 | 4 | |
| 1250000 | 2½ | 4½ | 4½ | |
| 1500000 | 2½ | 4½ | 5 | |
| 1750000 | 3 | 5 | 5 | |
| 2000000 | 3 | 5 | 6 | |

TWIN WIRE.

| | | | | |
|---|---|---|---|---|
| 14 | ½ | ¾ | 1 | 1 |
| 12 | ½ | ¾ | 1 | 1¼ |
| 10 | ¾ | 1 | 1¼ | 1¼ |

EXAMPLE.—To ascertain the size of conduit for three No. 0000 wire, follow down the wire column to No. 0000 and then across to the section headed "Three conductors in a conduit" and it will be seen that 2½-inch conduit is the size to use.

THREE-WIRE CONVERTIBLE SYSTEM.

| Size of Wires—2-Conductor Size B. & S. | Size of Wires—1-Conductor Size B. & S. | Size Conduit, inches. |
|---|---|---|
| 14 | 10 | ¾ |
| 12 | 8 | ¾ |
| 10 | 6 | 1 |
| 8 | 4 | 1 |
| 6 | 2 | 1¼ |
| 5 | 1 | 1¼ |
| 4 | 0 | 1½ |
| 3 | 00 | 1½ |
| 2 | 000 | 1½ |
| 1 | 0000 | 2 |
| 0 | 250000CM. | 2 |
| 00 | 350000 | 2½ |
| 000 | 400000 | 2½ |
| 0000 | 550000 | 3 |
| 250000CM. | 600000 | 3 |
| 300000 | 800000 | 3 |
| 400000 | 1000000 | 3½ |
| 500000 | 1250000 | 4 |
| 600000 | 1500000 | 4 |
| 700000 | 1750000 | 4½ |
| 800000 | 2000000 | 4½ |

SINGLE-WIRE COMBINATION.

NOTE.—When special permission has been given by the inspection department having jurisdiction for the installation of more than nine wires in the same conduit.

| No. of Wires | Size of Conduit, inches. |
|---|---|
| 3 No. 14 R.C. D.B. solid | ½ |
| 5 No. 14 R.C. D.B. solid | ¾ |
| 10 No. 14 R.C. D.B. solid | 1 |
| 18 No. 14 R.C. D.B. solid | 1¼ |
| 24 No. 14 R.C. D.B. solid | 1½ |
| 40 No. 14 R.C. D.B. solid | 2 |
| 74 No. 14 R.C. D.B. solid | 2½ |
| 90 No. 14 R.C. D.B. solid | 3 |

be used in permanently dry locations where excessive temperatures are present, provided special permission in writing be given in advance.

Slight changes in the wording of Rule 26*o* were adopted, and the following was inserted in place of the first method given for supporting cables:

Approved clamping devices constructed of or employing insulating wedges inserted in the ends of conduits.

Another suggested method for supporting cables was referred to the Committee for report at the next revision.

A change in Rule 26*x*, requiring chain fixtures to be wired with flexible conductors, was adopted, and the secretary was instructed to insert the necessary wording.

In Rule 27*c*, fourth paragraph, the word "readily" was omitted from the second line, and the secretary was instructed to make consistent changes elsewhere in the Code, as in fourth paragraph, second line, of Rules 28*f* and 29*d*.

In 28*f*, fourth paragraph, the following words were stricken out: "to which the ground wire must be soldered."

A new rule 28*i*, was adopted as given on the preceding page.

A new sentence was added to Rule 28*l*, as follows: "Multiple taps having opposite polarity will be permitted in switch and junction boxes."

At the session on Thursday morning an amendment to Rule 30*a*, permitting the omission of insulating joints and canopy insulators in a great many cases, was recommended for adoption by the Electrical Committee, but, after considerable debate, it was decided to refer this matter back to the Committee and retain the previous provisions of the Code for the present.

A proposed addition to Rule 30, concerning the grounding of portable fixtures to one side of the circuit, was referred for consideration to the Committee on Grounding Secondaries for report at the next revision.

A proposal to change Rule 31*c* so as to require switch control of keyless sockets, was referred to a special committee, with power to act.

Another proposed addition to this rule was referred to the Committee on Grounding Secondaries for a report at the next revision.

Rule 32*e* was amended to read as follows:

Unless provided with approved metal armor, must not be used in show windows or in show cases, except that approved portable cord may be used for the purpose of supplying current to portable lamps and other devices for exhibition purposes, and flexible cord may be used for chain fixtures.

Proposed changes to Rule 59 were referred to the Committee on Cabinets for report at the next revision.

Rule 65*h* was amended so that the second sentence shall read as follows: "For switches designed for currents of 30 amperes or less, heavy clamps or screw and washer connections with upturned lugs may be used."

The fine-print note was changed to read as follows: "A set screw gives a contact at only one point and is more likely to become loosened, and is almost sure to cut into the wire."

The second paragraph of Rule 65*l* was changed to read as follows:

Sub-bases must be so designed as to separate the wires at least one-half inch from the surface wired over. They must be of a non-combustible, non-absorptive insulating material, except for use with wooden molding, where they may be of hard wood.

The second paragraph of Rule 65*s* was stricken out.

A slight change in wording was made in Rule 67*e*.

Rule 67*j* was amended by adding to the last fine-print note the following: "Except that in 125-250-volt systems with grounded neutral, the cutouts in two-wire, 125-volt branch circuits may have the spacing specified for not over 125 volts."

A proposed change to Rule 68*f* was referred to the Switch and Cutout Committee, with power to act.

A proposal to insert in Rule 72*a* a provision that the 250-watt rating for medium-base sockets would be withdrawn on January 1, 1917, was referred to the Committee for a report at the next revision.

Proposals to amend Rule 77 were referred to the Fixture Committee for report at the next revision.

An addition to Rule 78*a* was adopted, as follows:

Holes for the supporting screws which secure this material in position must be so located or countersunk that there will be at least one-half inch space, measured over the surface, between the head of the screw or washer and the nearest live metal part.

An addition to Rule 79*a* was adopted, as follows:

When such device carries a visual oil indicator, the marking shall be for the proper oil level with the starter assembled. If the visual indicator is not used, markings shall indicate the oil level prior to assembling.

The third paragraph of Rule 83*b* was changed to read as follows:

Transformers, unless of weatherproof type, cutouts, flashers and other similar devices, must be inclosed in approved cutout boxes or cabinets, except that if on or within the sign structure, must be in a separate completely inclosed, accessible and weatherproof compartment, or, in a substantial weatherproof box or cabinet of metal of thickness not less than that of the metal of the sign itself."

Proposed changes to Rules 91 to 105, inclusive, dealing with marine work, were referred to the Electrical Committee, with power to insert in the Code, and with instructions to confer with a committee of the American Institute of Electrical Engineers and to harmonize them with the rest of the Code.

Suggested changes to the Index were also referred to the Committee, with power to act.

## Among the Contractors.

Two Columbus, O., department-store contracts have fallen to the Avery-Loeb Electric Company, of Columbus, O., in the matter of show-case lighting. By the system employed ordinary lamps are used, the light from which is given a soft, well-diffused effect through the aid of reflectors. This, it is claimed, gives a cheaper and much more satisfactory light than the old system, and justifies the new installation. The same company has the wiring contract for a six-story business block which the United Woolen Mills Company is remodeling.

The McKeever Electric Company, Columbus, O., has secured the wiring and fixture contract for the McClure, O., high school, also a contract for a $1,000 telephone switchboard to be installed at Kent, O., and a $5,000 contract for wiring the new Stoddard Avenue school building in Columbus.

The J. & M. Electric Company, Utica, N. Y., is moving into a commodious new store at 26 Bank Place. The arrangements made will be up to date and convenient for retailing electrical merchandise and also for conducting a supply and construction business, the fixture show room being an especially attractive feature of the establishment. The J. & M. Electric Company has recently undertaken the electrical construction in the Mayro Building, consisting of 100 offices and 22 stores. Also in the new Utica theater for the American Motion Picture Company. This building will have the most complete electrical equipment of any theater in the state outside of New York City. The company has recently completed the installation in the Consolidated Water Company's building, and also the construction of a complete electric lighting system in the town of Westmoreland. The treatment for street lighting on the newly opened Proctor Boulevard has proved highly satisfactory, and is a remarkable demonstration of the efficiency of nitrogen-filled series incandescent lamps for ornamental residence street-lighting service.

The Beck Electrical Construction Company, Minneapolis, has taken out a permit for the electrical work on a 19-apartment building, at 1906 Third Avenue, to be built by the Anderson-Nelson Construction Company. The Beck Company is also equipping a flat on Bedford Avenue, with complete installation of electric lights, bells, etc.

# National Association of Electrical Inspectors.

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H. S. WYNKOOP, Vice-President, Municipal Building, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
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"LET THE CODE DECIDE."

### Secretary's Message.

The Secretary regrets the small amount of matter this week and trusts that it will be forgiven in view of the report of the meeting telegraphed from New York which appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 27. The appointments to the committee which is to deal with cutouts on remotely located motors should read: W. L. Smith, Morris Todell, O. E. Smith.

There has been so much to do in connection with the meeting that it has been found simply impossible to get a full report of the proceedings and officers' reports in shape for this issue, but the members may feel assured that they will soon receive full information of many very interesting and important matters.

In the meantime the Secretary *must have material for these pages* and he must have it promptly or quit the business. Let the members who were present take to heart Ex-President Day's remarks referring to this matter and let those who lost the great event of their lives make up for it by sending some questions to this office.

### Flatiron on Lighting Circuit.

**Question 293. Will Rule 25a allow a flatiron receptacle to be placed on a lighting circuit which already has 500 watts of lighting on it?**

Answer 1 (O). The connection of the receptacle on the 500-watt circuit is not a violation of either Rule 25*a* or Rule 23*d*, but as soon as the iron is connected to the receptacle Rule 23*d* is violated, assuming the iron takes more than 160 watts. The matter of controlling the use of portable devices has reached such a point of difficulty that it would seem inadvisable for an inspection department to issue any form of approval on the wiring of an installation without excluding portable devices.

Answer 2 (F, G). No; Rule 23*d* specifies no set of small heating devices, incandescent lights or small motors, whether grouped on one fixture or on several fixtures, or pendants requiring more than 660 watts, shall be dependent on one cutout.

**The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.**

**It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.**

**The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.**

Answer 3 (B). If this iron was installed for constant use during time lighting circuit was in operation, it should not be attached to same, but should have a separate and distinct circuit of its own. If it is an iron which is to be used in the household at times when lighting circuit is not in service we see no objection to its installation on lighting circuit provided it is properly installed.

Answer 4 (W). Yes; if the fuse does not exceed the 660-watt circuit limit.

Answer 5 (A). As the rule reads I should say not, taken in connection with Rule 23*d*. My experience is that it is bad practice to install plugs for flatirons on lighting circuits, not so much from danger as from inconvenience. If in using the iron a fuse blows it is not fixed usually till the lights are to be used, then often it is too late to procure one and the man of the house promptly improvises his own fuse.

Answer 6 (H). In connection with Rule 23*d*, no.

Answer 7 (E). We have so understood it on the assumption that the flatiron is not generally used when the lighting load is on the circuit. If it were permitted, ten-ampere fuse would protect the added load.

Answer 8 (P). I should not approve the placing of a flatiron receptacle on a lighting circuit which already had 500 watts of lighting on it; but the disapproval would be based on Rule 23*d* and not on Rule 25*a*.

Answer 9 (U). I should say not.

Answer 10 (N). There is a conflict here between Rules 25*a* and 23*d*. Rule 25*a* says "heaters of 660 watts capacity or less may be individually connected to lighting circuits;" while Rule 23*d* says no combination requiring more than 660 watts may be dependent upon one cutout. Taking these two together, it would appear that if the iron called for more than 160 watts the receptacle could not go on. This vividly shows up the difficulty and the uselessness of the inspection and approval certificate in view of possible future changes.

This will probably be covered by the allowing of 660-watt and smaller receptacles on branch lighting circuits and specifying that each shall be counted as one of the allowed 40-watt outlets.

Really, provided the fuse remains at the specified 10 amperes, the desired point is covered.

### Should 250-Watt Sockets Be Eliminated?

**Question 294. In the "Preliminary Report on Standardization of Plugs and Receptacles" (see Electrical Review and**

**Western Electrician, February 6, page 245) is any provision made against attaching 660-watt devices to 250-watt key sockets, etc., and should not some notice be taken of this possibility?**

Answer 1 (U). I think this very important, although, the paper not being at hand, I cannot say exactly how to consider it.

Answer 2 (O). This would seem at the present time a matter of concern principally to the National Electric Light Association. However, earnest efforts should and are being made by all interests to eliminate entirely the 250-watt socket.

Answer 3 (F, G). It would be highly desirable to have this point taken care of.

Answer 4 (B). A 660-watt device should *never* be connected to a 250-watt key socket and, when found, its removal should be promptly brought about by the inspection department having jurisdiction.

Answer 5 (W). I do not see that any such provision is made, and certainly it is common knowledge of most inspectors that notice should be taken of it and provision made to prevent the dangerous practice of allowing 660-watt plugs to fit in standard 250-watt sockets.

Answer 6 (A). I certainly think notice should be taken of this risk and steps taken to discountenance this very dangerous practice.

Answer 7 (H). This matter should most certainly be taken up and the practice made impossible.

Answer 8 (E). The writer feels it unwise to attach a load of 660 watts to a fitting that is intended for 250 watts, especially when such fitting is a key socket.

Answer 9 (P). There does not appear to be any provision against attaching the 660-watt device to a 250-watt key socket. In my opinion, however, this point can be covered by the Laboratories' refusal to approve a receptacle for large devices if it is designed to screw into a lamp socket.

Answer 10 (N). There is no provision against it. It should be arranged in some way so as to make the practice impossible. It is a vital, steadily growing and already very serious danger, especially in domestic risks.

The supply companies are incessantly looking for the growth of the small-consumer business, striving to escape the high-efficiency-lamp influence on diminishing returns, by getting the consumer to use heating and power devices, and these, as every inspector concerned with residence and domestic risks (to which as the companies admit they must look more and more for improving the load-factor) knows, are put on the market and sold by department stores, regular dealers and sales rooms of power companies fitted with swivel screw plugs which "fit any socket" without any separable connection. The man concerned with factory and business risks only does not and cannot realize the danger, but it is there in every mansion, cottage, and farm house with electrical service in the country and growing more serious every day.

## Electrical Hazards.

Ralph G. Hudson, instructor in electrical engineering in the Massachusetts Institute of Technology, writing on "Safety First in Electricity" in the *Technology Monthly*, points out that only one per cent of fires reported by the Boston Fire Department are recorded as being due to electric origin. The number of fatalities due to contact with high-tension wires is likewise comparatively small. In Massachusetts seven persons are the average number killed annually; gas caims a larger number of victims. Nevertheless, there is a call for increased carefulness.

Mr. Hudson says that almost every electrical fire or death due to shock is caused by ignorance or too great trustfulness. With reference to the former, infractions of the National Electrical Code are usually responsible.

The abuse of key sockets is pointed out. Sometimes salesmen of devices assure the buyer that they can be connected to any lamp socket, even when they really require one of large capacity.

The writer suggests that in bathrooms all electric fixtures be placed out of reach of an occupant of the bathtub, to obviate the risks of shock, which in Massachusetts claim one victim a year, on the average.

Common sources of danger are mentioned: The flying of kites, with wire in place of string, in the neighborhood of high-tension lines; the throwing of surveyors' steel tapes across electric wires; attempting to start arc lamps by pulling on the lowering chain; climbing into trees threaded by electric wires. Each year sees some new complication hitherto unrecognized, which results in casualty or fatality.

Rigid inspection, the grounding of secondary circuits and the installation of lighting arresters, are vital remedies.

## Kelvin Memorial Fund.

The Executive Committee of the Kelvin Memorial Fund has decided to apply the balance of the Memorial Fund (amounting to about $2,200) to the establishment of a Kelvin Gold Medal, to be awarded triennially as a mark of distinction in engineering work or investigation of the kinds with which Lord Kelvin was especially identified, in accordance with the following arrangement. The Institution of Civil Engineers will be requested to accept the trust and administration of the Medal Fund. The award will be dealt with by a committee in London to consist of the presidents for the time being of the Institution of Civil Engineers; the Institution of Mechanical Engineers; the Institution of Electrical Engineers; the Institution of Naval Architects; the Iron and Steel Institute; the Institution of Mining and Metallurgy; the Institution of Mining Engineers; the Institution of Engineers and Shipbuilders in Scotland.

The committee thus constituted is to make the award of the medal after considering recommendations to be invited from the leading engineering societies in all parts of the world. The first award of the medal is to be made in the spring of 1916.

## Insufficient Postage on South American Mail.

A prominent engineer of Argentine, South America, states that manufacturers of electrical apparatus in the United States should issue instructions to their mailing departments to take great care to see that the literature they are sending to South America is properly stamped. Buyers of material in the South American republics are receiving lists for which they are obliged to pay surcharges of some considerable amount in gold. There has not been much criticism upon the part of the recipients, but it is feared that the post office departments of the South American countries will become dissatisfied.

## New English Central-Station Association.

The chief assistant electrical engineers of the Greater London electricity undertakings or central stations are forming a new association, the object of which will be to "encourage an interchange of ideas, foster mutual interests, and generally create a better understanding between the executive staffs of different electric light undertakings."

A model dwelling, where all of the housework is done by electricity, is one of the exhibits in the Palace of Manufacturers at the Panama-Pacific Exposition, San Francisco, Cal.

# Public Service Commissions

Conducted by William J. Norton

## CALIFORNIA.

**The Southwestern Home Telephone Company** was authorized to renew promissory notes totalling $11,000. The notes are to be secured by a pledge of $22,000 of the company's bonds.

## DISTRICT OF COLUMBIA.

**The Washington Railway and Electric Company** was authorized to issue $353,000, face value, of its general improvement 6-per-cent debenture bonds. The proceeds are to be used for extensions, additions, and improvements, and for reimburstment of funds expended for these purposes in compliance with certain orders issued by the Commission and by direction of Congress.

## IDAHO.

**Beaver River Power and Light Company.**—Upon a rehearing of the case, the Commission had dismissed the application of the Beaver River Power and Light Company for a certificate of convenience and necessity in the City of Pocatello and territory served by the Southern Idaho Water Power Company. This decision is very interesting when considered as a companion case of the application of the Idaho Power and Light Company for authority to enter territory served by the Great Shoshone and Twin Falls Water Power Company.

The certificate was granted in the latter case and competition was permitted. The opinion in the case was reported at length in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, February 6, 1915, p. 249. The circumstances in both cases are practically the same. The Commission refused to grant a certificate to the Idaho Power and Light Company for operation in the counties of Twin Falls, Gooding and Lincoln, February 18, 1914, and a certificate was refused the Beaver River Company for operation in Pocatello, November 7, 1914. Certain legal questions were involved in these cases as to the power of the Commission to prevent the operation of these companies, in view of the fact that certain franchises and power rights had been secured prior to the enactment of the Public Utilities Law. . These questions were decided in favor of the Commission and the orders upheld in a decision rendered by the Supreme Court of the State, June 27, 1914. These decisions of the Commission and Court presented very clearly the evils resulting from competition and upheld the right of a public utility under regulation to be protected from useless competition.

On December 9, 1914, a change having taken place in the membership of the Commission, both cases were opened for a rehearing, and hearings were had at the same time in both cases.

The decision granting the application of the Idaho Power and Light Company, which has been fully reported, followed the doctrine laid down by the California Railroad Commission in the Great Western Power Company case and opened the door to serious competition.

The decision just handed down in the Beaver River Company case bars the threatened competition.

The applicant holds a franchise from the city of Pocatello and has expended "a large amount of money in the actual construction of its plant and system in said city." The Commission finds that the same issues are involved as in the Twin Falls case, and says: "The rule of law announced in that case as to the construction of Section 48-a-b-c is hereby reaffirmed withoutout further comment. Let us now apply the facts in this case to the rule therein announced and see if they fall within said rule." The Commission then takes up the questions as in the Twin Falls case, but answers them in favor of the company in the field. Were the rates of the company in the field reasonable, the service adequate, the territory completely served? Can the applicant furnish service at less cost? The Commission finds that the Southern Idaho Company has sufficient installation to supply present and future needs, and its system extends all over the city, taking care of all demands of all citizens.

In regard to rates the ordinance fixes a rate of 10 cents per kilowatt-hour without discount. "However, the evidence shows that the applicant company was willing to furnish power for lighting at a maximum of nine cents per kilowatt-hour with a discount of ten per cent if paid within a certain time." A provision in the ordinance explains why the city has not taken advantage of the lower rates. The city is to receive from one to one and one-half per cent of gross annual revenue. The Commission expresses its disapproval of such franchise provisions as follows: "This provision of the ordinance providing for the payment to the city of a certain per cent of the gross receipts of the company is not looked upon with favor by this Commission. There is no reason in justice or equity why the users of the commodity of a certain public utility should be required to pay such a rate as to enable the public utility to pay to the city a certain per cent of its gross earnings, to be used by the city for general purposes. If funds of that kind are needed a tax should be levied on all of the property within the city's boundaries."

The reduction in rates offered by the applicant company, the Commission finds, "is not such a reduction as to warrant this Commission in permitting the applicant to enter this field. The reduction must be a material reduction." When the applicant secured its franchise it gave the impression that it would furnish electrical energy from hydroelectric plants, but after obtaining the franchise it proceeded to install a Diesel engine plant.

The company claims it can furnish service from this plant at lower cost than the present hydroelectric service. It submits an estimate of the probable cost of its service but bases its conclusions on the securing of a 50-per-cent load-factor. The decision says it is highly improbable that, with two companies sharing the business, the new company would be able to secure such a load-factor. The cost of production of the established company appears to be only about one-half as high as the cost of production of the proposed service.

Upon the above finding of facts the application is again denied.

A dissenting opinion is filed by Commissioner Freehafer which takes up each question considered in the majority opinion, and finds the facts in favor of the applicant company and in favor of admitting the competition. He says: "I believe the stimulus of competition will create new and constantly increasing demands for service." . . .

"The fact that the applicant company had secured a franchise prior to the time our utilities law became effective, and that pursuant to the securing of such franchise has expended large sums of money in its enterprise, is an added fact that should lead us to treat it with more liberal consideration than would be accorded a new utility asking admission to a field already occupied. However, I will not hold that applicant company may establish itself in the heart of the city of Pocatello, and, as it were, take only the cream of the business." . . .

"I would impose conditions on the applicant company requiring it to extend its lines and furnish all classes of service now being furnished by the existing utility over the entire field.

"I am not incredulous as to what may be accomplished in generating electrical energy by the Diesel engine. In fact I have long since ceased to be incredulous as to any claim made by inventors and in the light of all evidence before me in this case, I very much desire that the Diesel engine be given a trial in Idaho."

In regard to the city revenue provision in the company's franchise, Commissioner Freehafer agrees with the majority opinion. He says: "I agree with the majority opinion that the provision of the franchise secured from the city of Pocatello by the applicant company, whereby the city was to receive a certain per cent of the gross annual revenue of the applicant company was not a wise provision, as it would result in discrimination as between tax payers of the city by requiring users of electrical current furnished by that particular company to provide funds for the use of the whole city, but it is within the power of this Commission to eliminate that provision, and a reduction in rates equal to the proposed donation to the city should be ordered by the Commission."

## MARYLAND.

**Chesapeake and Potomac Telephone Company.** The Commission has under consideration the valuation of the company's property which is to serve as a basis for rate-making. The Commission's representative and the company's representatives have co-operated to determine a valuation of the physical property which would be reasonable and satisfactory to the public, but no conclusions have been reached as to allowances for overhead charges and for going value, cost of buying out competing lines, and other intangible values.

## MONTANA.

**Standards for the form and filing of public utility rate schedules** have been adopted by the Commission and will be put in effect at once. Hereafter all rates, rules and regulations must be filed with the Commission and must conform to the standards thus established.

**Rules of Practice and Procedure.**—The Commission has revised its rules of practice, making some changes in the method of procedure in handling cases.

## NEW YORK.—Second District.

**The Canadian American Power Corporation.**—In connection with the rehearing of the Commission's order in the Canadian American Power Corporation case, attorney for the company has filed a brief prepared by the Hon. Albert Haight, formerly judge of the Court of Appeals, in which Judge Haight, sustains the action of Commissioners Decker and Hodson in authorizing the capitalization by the Canadian American Power Corporation of its contract for electricity from tht Canadian side. This action of the Commission was attacked by counsel for the Legislative Investigating Committee at recent hearings. Judge Haight in his brief says that he has examined the contract and is famiilar with the value of electric power in the vicinity concerned in this case.

"Seemingly, therefore," the opinion says, "the contract would become one for the benefit of both the producer and the distributer and as such becomes property subject to all the rights of parties under the law Merchant. Being property, it appears to me that the Public Service Commission in the statute for the exercise of the powers and discretion vested in it by the statute may in the exercise of such powers and discretion, authorize the issue of stock for the fair market value thereof."

The Commission ordered a rehearing of this case after it had been notified through the State Department at Washington that the Canadian government was calling attention to the yearly terms of its license for the export of power. At the rehearing, which was recently held, there were no appearances in opposition to the capitalization order, and the attorney for this company presented evidence to show that its contractual rights under which power is imported from Canada must be respected despite the license restrictions of the Canadian government.

## RHODE ISLAND.

**The Providence Telephone Company** filed with the Commission new schedules reducing the rates for all classes of service in Coventry, Hope Valley, Narragansett Pier, Newport, Pawtucket, Woonsocket and Valley Falls.

## STATE REGULATION.

**By William J. Norton.**

State regulation of public utilities, which started off so well in 1907 under the able leadership of Governor LaFollette in Wisconsin,, and Governor Hughes in New York, has reached a most critical stage in its development.

What are the difficulties which now confront state regulation? What are the remedies for these difficulties? Who is to blame for the seemingly bad ways in which regulation finds itself in many states today? And what of the future?

In New York all except two of the able men appointed by Governor Hughes have disappeared from the service, and it is fair to assume that these two will go within the month. The inability of three Domocratic governors to recognize non-partisanship in important appointments is responsible for this absolute failure in efficiency. This is especially interesting because when Governor Hughes's attention was called to the absence of a non-partisan clause in the original public-service bill, he drew himself up and said, "Gentlemen, you must remember the Chief Executive of the State of New York will always be big and broad enough to respect the principal of non-partisan appointments."

And so the blame in New York rests squarely upon the smallness of its recent governors.

In Wisconsin, a similar condition exists, but the cause is different. Here we find but one of the original appointees with the Commission, and if rumor is correct the state is only retaining his services by a very slender thread. The governors of Wisconsin, however, have done their duty in trying to keep the old commissioners, who have rendered most excellent service. On the other hand the public in Wisconsin has grown tired of commissions, and while this public criticism is never openly directed toward the Railroad Commission, there seems to be a smug satisfaction in the hope that the Railroad Commission may be suppressed, to some extent.

So here we have in a most "progressive" state—a pioneer in modern regulatory thought—a weariness on the part of the public in regard to regulation, no sustained constructive policy, but a fickleness—a restlessness that carries its own warning.

Again as we look over the field we find trouble appearing in many other commissions.

In California the president of the original commission evidently considered his office as a stepping stone to a higher office. If newspaper reports can be relied upon, two other commis-

sioners are openly accused of using their office to further personal ends. Here we seem to have difficulty with the actual men who have been charged with the regulatory duties.

In Idaho, the old commission handed down a decision seemingly fair and in line with the best economic thought, disapproving competition and duplication in a field already well served. The decision was upheld by the courts—but the public demand competition. Heads fell and a new commission reversed the decision, and competition is allowed to take its bitter revenge upon an unthinking but insistent public.

In Kansas several years ago the public became dissatisfied with the old commission, and a new governor named a new commission, evidently with the idea that they would be less conservative, but the new commission has accomplished little.

In Illinois, Governor Dunne, in spite of the warning of nearly half of the voters upon the little ballot for "home rule"—a carefully designed and advertised plan to show that the people of Chicago really wanted home rule, which went badly astray—is urging a separate commission for Chicago, although the Illinois State Commission has made notable progress in its utility work.

In Indiana, an able, though apparently harassed commission has just started in its work of administering what is perhaps the fairest and best constructed of all of our state utility laws, and yet a bill has been introduced in the present legislature, the first since the passage of the law, which the author openly states "will take all initiative power away from the Commission, and leave it nothing but appellate jurisdiction in public-utility matters" and grants such authority to the municipalities.

In Ohio, the public and the governor grew tired of its noisily radical but quietly conservative commission in 1913, and a new law was passed and a new commission appointed. Additional changes may be expected this year.

In Vermont, a governor, incensed because the commission refused to hastily reduce telephone rates at his command, demanded the resignation of the commissioners and appointed new ones.

In the District of Columbia, commissioners under the very shadow of the Federal Government, without thoroughly trying regulation—the work to which they were appointed—openly advocated municipal ownership. No wonder the Chamber of Commerce of Washington passed a resolution opposing the enactment of the bill providing municipal ownership of street railways of the District, basing its opposition on the ground "that the efficacy of government regulation, as provided in the Public Utilities Commission, has not yet been sufficiently tried out."

All of the commissions have just begun to make progress and learn how to regulate. If let alone the public can expect good results in the next few years. Some have done remarkably well—New Hampshire, Maryland, New Jersey, Georgia, New York, Wisconsin, Oklahoma and California. Others have apparently accomplished little—but they are slowly learning the work and results should soon follow; such as Rhode Island, Connecticut, West Virginia and Oregon.

Some have been bitter and unfair, notably Missouri, but even such a commission will learn, and a good spanking from the courts may help them to grow up.

Not much help, however, can be expected from the courts. The tendency is for the appellate decisions to be inconsistent and destructive rather than constructive, as for instance the recent decision of the New Jersey Court of Appeals in the Paterson-Passaic gas case. This decision, resulting from a friendly suit to test the law, has literally thrown four years of excellent work by the commission, under an excellent law, into the waste-paper basket.

After all, regulation cannot be accomplished by the courts but only through the co-operative effort of

(1) The Public—giving fair support.

(2) The Commission itself—giving industry and efficiency.

(3) The Utilities—giving fair play.

But taken as a whole, we find an element of haste, impatience and distrust that causes the municipal-ownership partisans to cry from the housetops that "state regulation has failed."

State regulation—real state regulation—has not failed in the United States, because so far only a few states, Massachusetts, Wisconsin, Maryland and California, have really tried it, the others are merely getting ready to regulate. Even New York, which should be regulating efficiently by this time, is only a beginner, and behind many other states, which started later. And in the four states where it has been tried, it absolutely is not a failure, but very much of a real success.

In this real crisis then who is to blame? The utilities? The commissions? Or the public, in general, and as represented by authorities?

The utilities, I believe it can fairly be said, have painstakingly co-operated to a large extent, honestly and industriously, because they all feel that fair regulation is a good thing for the utility itself.

The commissioners, as individuals, and as collective bodies, almost without exception, have given industry and intelligence to the many difficult and intricate problems which have come before them, and as a class they stand high above the usual run of public servants.

But how about the public—and the responsible executive authorities? Here undoubtedly we have the weakest link in the chain—*the* weak link.

The public has not yet realized that in attempting to curb and restrain the utilities they themselves have accepted a very great responsibility. Even if their aim is only efficient regulation, the responsibility is there, but if the aim is a great preparation for government and municipal ownership, as some claim—how much greater is their responsibility!

For failure to regulate properly—actual inability to regulate—spells the same failure and inability to operate, the much harder problem. There can be no doubt whatever that a failure here, at the time, means a long and tedious delay, and not a triumphant entry for government and municipal ownership.

Perhaps sadder than the failure of the public to fully realize its own responsibility for the ultimate success of regulation has been the more deliberate failure of the public's executives to recognize the need of efficient, unpartisan, non-political appointments—a failure to rise above the sordid plane of party rewards and obligations. Here is the real source of the trouble. And it is only fair to say that, after all, regulation was more or less unwillingly forced upon the public by ambitious executives, eager for applause for passing "up-to-date" and "progressive" legislation. That most of it was really good legislation is a happy accident, for which many of such executives are really not to blame, and the public, upon which the burden fundamentally falls, is to be sincerely congratulated.

And so the trouble is finally located in the usual whirlpool of bad, inefficient political method and result, and becomes only the well known problem of American Democracy. For the purpose of this article we can leave it with those critics and students and reformers—it really will not add much to their already heavy burden.

Then, too, this will allow us to face our own direct responsibility—we public—we commissions—we utilities; so altogether—no looking back now—hands firm on the plow—regulation must and shall succeed!

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A business man of Brockton, Mass., has devised a lighting apparatus by which incandescent lamps are fixed, one to the upper of each boot and operated by a storage battery carried in the pocket. The exhibitor attracted attention as he strolled about the city.

# Electrical Engineering Problems.

By R. G. Hudson and W. V. Lyon.

## DIRECT CURRENTS.

**Problem 30.**

A 230-volt, 15-horsepower shunt motor runs at no load at a speed of 1,250 revolutions per minute and takes a current of 5 amperes from a 230-volt line. With the armature at rest a current of 50 amperes flowing through the armature produces a potential drop of 10 volts between the brushes. If the field current is maintained constant at 2.4 amperes and the stray power is assumed to be constant at all loads, find (*a*) stray power, (*b*) line current at full load, (*c*) efficiency at full load, (*d*) efficiency at half load, (*e*) speed at full load, and (*f*) the full-load torque.

### SOLUTION OF PROBLEM 30.

The power input to the motor at no load is 230×5, or 1,150 watts. The power expended as heat in the shunt field is 230×2.4, or 552 watts. Since a current of 50 amperes flowing in the armature at stand-still produces a drop of 10 volts between the brushes, the armature resistance between brushes by [6] equals 10/50, or 0.2 ohm. The armature current at no load being 5—2.4, or 2.6 amperes, the power expended in heating the armature winding at no load by [20] equals $(2.6)^2 \times 0.2$, or 1.35 watts.

**Answer to Question a.**

The stray power under no-load conditions is then given by [43]

$$S.P.=1{,}150-552-1.35=597 \text{ watts.}$$

**Answer to Question b.**

Since one horsepower equals 746 watts, the output at full load equals 15×746, or 11,200 watts. The output, moreover, equals the input minus the losses. Hence we may write

$$11{,}200=230I_1-552-(I_1-2.4)^2 0.2-597,$$

the unknown line current at full load being represented by $I_1$. Simplifying this equation, we have the following quadratic

$$I_1^2-1{,}155I_1+61{,}750=0.$$

Solving for the line current ($I_1$), we have

$$I_1=56.2, \text{ or } 1{,}099 \text{ amperes.}$$

Although the value, 1,099 amperes, satisfies the full-load conditions, it cannot be regarded as a practical solution since the motor could not carry this current without overheating and would run at a very low efficiency. The line current at full load must then be 56.2 amperes.

**Answer to Question c.**

The output at full load is 11,200 watts and the input is 230×56.2, or 12,900 watts. The efficiency of the motor at full load, or the output divided by the input, is then 11,200/12,900, or 86.8 per cent.

At half-load the output is 7.5×746, or 5,600 watts. Since the shunt-field loss is 552 watts and the stray power loss is 597 watts, we may write

$$5{,}600=230I_1-552-(I_1-2.4)^2 0.2-597.$$

Simplifying this equation we have the following quadratic

$$I_1^2-1{,}155I_1+33{,}750=0.$$

Solving for the line current ($I_1$), we have

$$I_1=30 \text{ or } 1{,}125 \text{ amperes.}$$

Discarding the impractical result, 1,125 amperes, the line current at half-load must be 30 amperes. It will be noted that the line current at half-load is not one-half the line current at full load.

**Answer to Question d.**

The output being 5,600 watts and the input, 230×30, or 6,900 watts, the efficiency at half-load is 5,600/6,900, or 81.1 per cent.

**Answer to Question e.**

The armature current at no load being 5—2.4, or 2.6 amperes, the armature voltage at no load by [3] is

$$E_a=230-2.6\times 0.2=229.5 \text{ volts.}$$

The armature current at full load is 56.2—2.4, or 53.8 amperes and the armature voltage is then

$$E_a=230-53.8\times 0.2=219.3 \text{ volts.}$$

Assuming that the flux ($\Phi$) in [45] is constant, i. e., neglecting the effect of armature reaction, it will be noted that the speed ($S$) is proportional to the armature voltage. Hence the speed ($S$) at full load is given by

$$S=219.3\times 1{,}250/229.5=1{,}195 \text{ revolutions per minute.}$$

**Answer to Question f.**

The speed being 1,195 revolutions per minute and the power output 15 horsepower, the full-load torque is given by [40]

$$15=1.90\times 1{,}195T/10^4$$

and $T$=66.1 pound-feet.

From data obtained by running the motor at no load and by assuming the stray

## ALTERNATING CURRENTS.

**Problem 80.**

A three-phase, 25-cycle, 2,200-volt induction motor is rated to deliver 1,000 horsepower at full load. The true resistance between terminals is 0.156 ohm for the stator and 0.0920 ohm for the rotor at the running temperature. Assume that at the running temperature the ratios of effective to true resistance are 1.35 for the stator and 1.65 for the rotor at a frequency of 25 cycles, and that the ratio for the rotor is 1.30 at a frequency of 12.5 cycles. The equivalent single-phase leakage reactance of both stator and rotor combined is 0.64 ohm. The ratio of transformation between terminal voltages is 2,200:1,520 volts. The motor is wound for 12 poles. The rotor winding is connected in star.

(*a*) What is the full-load torque calculated on the assumption that the slip is negligibly small? What is the maximum torque that the motor can give, and what is the slip at this time? (*b*) What line voltage should be impressed on the motor in order that the motor will give one-half of its full-load torque at one-half of synchronous speed? What is the value of the equivalent single-phase rotor current referred to the stator? (*c*) What reactance should be added to each phase of the rotor winding so that the motor will develop one-half of its full-load torque at one-half of synchronous speed when the impressed voltage has its rated value? What is the value of the equivalent single-phase rotor current referred to the stator? (*d*) What resistance should be added to each phase of the rotor winding so that the motor will develop one-half of its full-load torque at one-half of synchronous speed when the impressed voltage has its rated value? What is the value of the equivalent single-phase rotor current referred to the stator?

Compare the currents calculated in (*b*), (*c*) and (*d*) with the full-load value, which is approximately 400 amperes.

power to be constant at all loads, the line current, efficiency, speed and torque may then be calculated for any magnitude of power output. The results of such calculations plotted as ordinates against the power output in horsepower as abscissas give a set of curves called the "characteristic curves" of a motor. The assumption of constant stray power at all loads leads to little inaccuracy in the results, since the stray power constitutes but a small part of the total power input and therefore need not be measured to a high degree of accuracy.

### SOLUTION OF PROBLEM 80.

**Answer to Question a.**

If the slip is negligibly small the full-load speed is equal to synchronous speed. The latter is

by [41a] $N=120\times25/12$

$=250$ revolutions per minute.

If the motor is to deliver 1,000 horsepower at a speed of 250 revolutions per minute the torque developed is

$$T=1{,}000\times33{,}000/2\pi\times250$$
$$=21{,}000 \text{ pound-feet.}$$

The general formula for the torque developed as given in Problem 79 is

$$T=550PI_2^2r_2/(746\times4\pi fs)$$

For this motor it reduces to

$$T=0.0282I_2^2r_2/s$$

When the induction motor is running there is a voltage produced in the rotor winding due to its rotation which of course does not exist at standstill and which must be taken into account. This is easily done by writing the formula for the rotor current

$$I_2=V/[(r_1+r_2/s)^2+X^2]^{1/2}$$

$V$ is the line voltage impressed on the motor. $r_1$ is the equivalent single-phase effective resistance of the stator. $r_2$ is the equivalent single-phase resistance of the rotor referred to the stator. At standstill $r_2$ should be the effective resistance at the rated frequency but when the slip is small $r_2$ should be the true resistance. $X$ is the equivalent single-phase reactance of the stator and rotor combined referred to the stator. $I_2$ will then be the equivalent single-phase rotor current referred to the stator.

If this value of $I_2$ is inserted in the formula for the torque it becomes

$$T=0.0282V^2r_2/s[(r_1+r_2/s)^2+X^2]$$

When the slip is very small the torque is likewise small, but as the slip increases the torque increases up to a certain value of the slip and after that it decreases. In order to find the slip for which the torque has its greatest value we use calculus as the simplest method of obtaining the required result. If we do this the slip is found to be

$$s=r_2/\sqrt{r_1^2+X^2}$$

That is, when the slip has this value the torque developed by the motor has its greatest value. In this case the slip would be

$$s=0.096/\sqrt{0.105^2+0.64^2}$$
$$=0.148$$

$r_2=0.5\times0.0920\times(2{,}200/1{,}520)^2$

$=0.096$

$r_1=0.5\times0.156\times1.35$

$=0.105.$

The torque at this slip is

$T=0.0282\times2{,}200^2\times0.096/0.148[(0.105+0.096/0.148)^2+0.64^2]$

$=90{,}300$ pound-feet.

This is about 4.5 times the full-load torque.

**Answer to Question b.**

If the speed is to be one-half of its synchronous value the slip is also one-half. One-half of full-load torque is 10,500 pound-feet. Putting these values in the formula for the torque gives

$$10{,}500=0.0282V^2\times0.125/0.5[(0.105+0.125/0.5)^2+0.64^2]$$
$$10{,}500=0.00353V^2/0.268$$

### DIRECT CURRENTS.

**Problem 31.**

A 230-volt series motor runs at a speed of 800 revolutions per minute when its armature current is 90 amperes. The armature resistance is 0.12 ohm and the series-field resistance is 0.08 ohm. The air-gap flux for any magnitude of field current is given in Fig. 26.

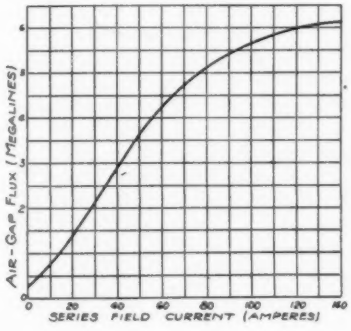


Fig. 26.

The terminal voltage being maintained constant at 230 volts, find the armature speed under the following conditions; ($a$) armature current, 45 amperes; ($b$) armature current, 5 amperes; ($c$) armature current, 90 amperes with a resistance of 0.5 ohm connected in series with the armature. What will the armature speed be when ($d$) the terminal voltage is 235 volts and the armature current is 90 amperes? Find the current-flux torque of the armature ($e$) when the armature current is 90 amperes and ($f$) when the armature current is 45 amperes.

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This problem illustrates the speed and torque characteristics of the series motor.

### ALTERNATING CURRENTS.

**Problem 81.**

The following test data are given concerning a three-phase, 25-cycle, 2,200-volt induction motor that is rated to deliver 500 horsepower at full load:

| | | |
|---|---|---|
| Poles | | 12 |
| Resistance between terminals | Stator | 0.358 |
| | Rotor | 0.0288 |
| At temperatures of (degrees centigrade) | | 25 |
| Ratio of transformation | | 2200:620 |
| No-load conditions at temperature of 25 degrees | Line voltage | 2200 |
| | Line current | 39.8 |
| | Power | 13,500 |
| Rotor blocked at temperature of 25 degrees | Line voltage | 760 |
| | Line Current | 291 |
| | Power | 118,000 |

The running temperature is 75 degrees centigrade.

Assume that the ratios of effective to true resistance are the same for the stator and the rotor.

($a$) Calculate the approximate value of the full-load slip. ($b$) What line current is supplied to the stator when the slip is 2.0 per cent? ($c$) What is the efficiency for this load? ($d$) What is the power-factor? What is the torque?

---

This problem illustrates the method of calculating the performance of an induction motor.

Solutions of the above problems and two new problems will be printed in the next issue.

$V$=892 volts.

The frequency of the current in the rotor is equal to the frequency of the supply circuit multiplied by the slip, so that in this case it is 12.5 cycles. At this frequency the rotor resistance is greater than it is when the slip is very small, since the resistance of a circuit to alternating current increases with the frequency. In this problem we are to assume that at 12.5 cycles the effective resistance of the rotor is 1.3 times the true resistance. Thus

$$r_2=1.3\times0.096$$
$$=0.125 \text{ ohm.}$$

The value of the rotor current referred to the stator is

$$I_2=892/[(0.105+0.125/0.5)^2+0.64^2]^{\frac{1}{2}}$$
$$=1{,}220 \text{ amperes.}$$

**Answer to Question c.**

Let us suppose that a reactance whose equivalent value is $x$ ohms is added to the rotor. The total reactance of the motor will then be $0.64+x$. Put this value in the formula for the torque.

$$10{,}500=0.0282\times2{,}200^2\times0.125/0.5[(0.105+0.125/0.5)^2+(0.64+x)^2]$$
$$10{,}500=17{,}000/0.5[0.126+(0.64+x)^2]$$
$$0.64+x=1.76$$
$$x=1.12 \text{ ohms.}$$

This is the value of the equivalent single-phase reactance referred to the stator. Referred to the rotor it would be

$$1.12\times(1{,}520/2{,}200)^2=0.535 \text{ ohm.}$$

And since the rotor is star-connected this is also the value of the reactance which should be added to each phase of the rotor.

The rotor current referred to the stator is

$$I_2=2{,}200/[(0.105+0.125/0.5)^2+1.76^2]^{\frac{1}{2}}$$
$$=1{,}200 \text{ amperes.}$$

**Answer to Question d.**

In this case we will suppose that a resistance whose equivalent single-phase value referred to the stator is $r$ is added to the rotor. Put this value in the formula for the torque.

$$10{,}500=0.0282\times2{,}200^2\times(0.125+r)/0.5[(0.105+(0.125+r)/0.5)^2+0.64^2]$$

It will be easier to solve this equation if we let $(0.125+r)/0.5=y$.

Then $10{,}500=136{,}000y/[(0.105+y)^2+0.64^2]$

or $0.011+0.21y+y^2+0.41=13y$

or $y^2-12.8y+0.421=0$.

This equation can be solved by the formula for a quadratic which gives

$$y=12.78$$

So that $0.125+r=0.5\times12.78$

$$r=6.26.$$

This is referred to the stator. Referred to the rotor it is

$$6.26\times(1{,}520/2{,}200)^2=2.99.$$

The rotor is star-connected so that this is also the actual resistance which should be added to each phase of the rotor in order that the torque shall be 10,500 pound-feet at a speed of 125 revolutions per minute for an impressed voltage of 2,200 volts. The equivalent single-phase rotor current referred to the stator is

$$I_2=2{,}200/[(0.105+12.78)^2+0.64^2]^{\frac{1}{2}}$$
$$=170 \text{ amperes.}$$

In this case the current is only about one-seventh as great as in the other cases, and is only about 40 per cent of the full-load current. Where the reduction in speed is accomplished by reducing the voltage or by inserting reactance in the rotor the current was about three times its full-load value. Observe that it makes no difference whether reactance is inserted in the rotor or the stator and that either has the same effect as reducing the voltage. Resistance, however, in order to be most effective, must be inserted in the rotor.

## New England Electrical Meeting.

A meeting of New England electrical men was held at the Mechanics Building, Boston, Mass., March 26. President Gibbs, of the New England Section, National Electric Light Association, opened the session, introducing Frank S. Price, of the Pettingell-Andrews Company, Boston, who presided.

J. M. Wakeman, general manager of the Society for Electrical Development, pointed out the need of co-operation for the development of local business. He referred to the improved business situation, and outlined plans for the National Electrical Prosperity Week, to be observed in December.

The associations of Great Britain will hold a like observance, and there are prospects of the movement being international in its scope.

H. W. Alexander, manager of the society's publicity department, described the motion-picture advertising campaign, including 45 different picture plays, costing over $7,000.

A. J. Edgell, in charge of the society's display service bureau, described the scope of his work, showing a large number of lantern slides illustrating the artificial lighting of show windows.

## Philadelphia Section Activities.

A martial air pervaded the March meeting of the Philadelphia Electric Company Section, National Electric Light Association. The meeting was held on March 16, and was opened by a band concert by the section's concert band, under the leadership of J. G. Johnson. The speaker of the evening was H. A. Hornor, who spoke upon the topic, "Men-of-War." The discourse was illustrated by lantern slides of battle ships and their equipment. Mr. Hornor stated that he had no doubt that America will build the first one-thousand-footer, and that no doubt she will be propelled by electricity.

The 365 members of the section who were present at this meeting listened with intense interest to Mr. Hornor's address, and were visibly impressed with the fact that electric current is the greatest thing not only in times of peace, but also in times of the most dreadful warfare. Following the discourse, the Entertainment Committee furnished a very elaborate and pleasing program.

A very fully attended meeting of the Engineering Department Branch was held on March 2. N. E. Funk read a paper entitled "Aluminum-Cell Lightning Arresters, What They Look Like and How They Work."

The Commercial and Meter Departments held a combination meeting on March 23. John Meyer presented a paper entitled "Examination of the Power Section of the Electrical Salesman's Data Book." P. H. Bartlett spoke upon the topic "Notes on Maximum-Demand Devices and Their Application."

## The Rathenau Foundation.

The Prussian Ministry has given approval to the Emil Rathenau Foundation established by Emil Rathenau in conjunction with the directorate and board of supervision of the Allgemeine Elektrizitäts Gesellschaft. The object of the foundation is to place the Physical-Technical Reichsanstalt in the position of being able to promote enterprise in the department of electricity and magnetism by the acquisition and maintenance of distinguished workers and the grant of aid to its members and collaborators for undertaking journeys of investigation to similarly equipped institutions, together with the appropriate provision of costly instruments for which State funds cannot be rendered available. The assets of the Foundation consist of debentures for 100,000 marks ($25,000). Further contributions are expected. An administrative council composed of the president of the Reichsanstalt and two others has been appointed to decide upon the use to be made of the available means and of any future additions to the fund.

## Civil Service Examination for Mine Electrician.

On April 28 the United States Civil Service Commission will hold an examination at the usual places to prepare a list of eligibles for filling a vacancy in the position of mine electrician in the Bureau of Mines and for similar vacancies as they may occur. The duties of this position are to make investigations bearing upon the safety of electricity in mines and the causes of mine disasters for which electricity may have been held to be responsible. These duties will involve considerable field work and travel. The salary of the position is from $1,200 to $1,500 a year.

## MINNESOTA ELECTRICAL ASSOCIATION.

### Eighth Annual Convention, St. Paul, March 23 to 25.

The eighth annual convention of the Minnesota Electrical Association, held at the St. Paul Hotel, St. Paul, March 23 to 25, was the most successful in many ways, if not in all respects, that the association has had. The papers covered a variety of subjects of keen interest to central-station men and to electrical workers in general. They were carefully prepared and well presented by men who are recognized as authorities in their different fields, with the result that the attendance at all the sessions was very creditable. Central-station men from the smaller towns of the state and from points outside the state constituted a large part of the attendance.

The question of how to interest the farmer in the use of electric light and power came up at one of the sessions, and from the trend of the discussion it seems safe to predict that this problem is going to receive increased attention in the immediate future. If the results that have been achieved in awakening the interest of the farmer in the use of the automobile and the telephone, and other modern conveniences, may be taken as a criterion, it seems very likely that such a campaign, wisely conducted, will result in the increase of central-station business through rural demands.

The convention was opened Tuesday morning, March 23, by President R. E. Brown, manager of the Consumer's Power Company, Mankato, with a brief address in which he asked the delegates to attend the sessions regularly, and make it a point to discuss freely the problems suggested by the different papers read.

There followed the reading of the reports of the secretary-treasurer, F. A. Otto, superintendent of the electric department of the St. Paul Gas Light Company, St. Paul, which showed the association to have a creditable balance on hand at the close of the fiscal year.

The afternoon session was opened by an illustrated talk on "Oil Engines for Central Stations," by C. G. Sprado, of the Allis-Chalmers Manufacturing Company, Milwaukee. By means of diagrammatic pictures, Mr. Sprado explained in detail the principles of operation of the gas engine, showed pictures of plants in which engines of the various types are in operation and cited efficiency results in specific cases. He then explained the development of oil engines and called attention to the latest improvements in engines of this type by which inferior grades of oil, purchasable in some places for less than a cent a gallon, has been successfully used. Mr. Sprado believes the usefulness of the high-economy oil engine has been proved and that its opportunities and possibilities for central-station use are large.

Mayor Winn Powers, of St. Paul, interrupted the business of the afternoon session long enough to welcome the electrical men to the city, and to express his appreciation of the importance of the interests for which they stand in the development of the state. As a sign of the activities opening up to them, the Mayor said that in St. Paul alone the building permits for the coming year amount to about $30,000,000. He advised the electrical men to be loyal to their organization, for in this way they are enabled to know one another better and a spirit of helpful good-fellowship is fostered. To this spirit of good-fellowship he would attribute the leading advantage of most organizations, because, said he, "it is not the piles of brick and mortar we build so much as the spirit of good-fellowship that counts in the end."

That the development of electric light and power is no more completed in the United States today than the development of the country itself was a point made in an address on the "Financing Problems of Public Utility Companies" by William H. Hodge, of H. M. Byllesby & Company, Chicago. Opportunities exist everywhere, Mr. Hodge said, for the creation of new utilities and the extension, unification and perfection of those already established. The most important factor in public utility financing Mr. Hodge believes to be the attitude of the people as expressed through their legislative representatives. Unfair attacks on public utilities, the speaker said, have been the chief obstacle in the obtaining of funds at reasonable rates for extending properties and service, even during periods of depressed development, like the present. In spite of the handicap of mistaken and sometimes mendacious attacks, the progress of public utilities in this country has been extraordinary.

"The public utilities of this country stand head and shoulders above similar industries in any other nation in the world," said Mr. Hodge. "They are of far greater practical use to the people and to a much larger proportion of the people, at much lower actual cost."

Mr. Hodge divides public utilities in two financial classes: those that are well established and whose permanency is not questioned; and those that are still in speculative stages. For the first, capital should be obtainable at rates not far above average interest rates; in the case of the second, the uncertainty makes higher prices for capital inevitable. Public utilities have developed under private ownership, Mr. Hodge said, because effort and reward has been the basic principle in the development of this country. Communities have always been ready to grant franchises for essential economic factors as they are needed. Ninety-five per cent of all the public marketed electrical energy in this country is produced by privately owned companies. Such a condition, Mr. Hodge argued, cannot be the result of mere chance.

Continuing, the speaker disparaged the campaigns of prejudice that are sometimes carried on with results that are destructive to the best interests of the public, and appealed for fair and businesslike legislation for public utilities of all kinds. In case there is to be a change of general policy from private to public ownership, it should be made without injustice to the men whose energy and capital developed the utilities.

Touching on the problem of rural electric service, Mr. Hodge stated that this is a question to which electrical men are giving increased attention each year. He suggested that the solution of it lay only in combining the electrical demands of the cities and towns with those of the country. If the cities want the problem solved and their trade territories benefited, they must do their part in encouraging the transmission companies to undertake the investment.

"On the other hand," he continued, "the representatives of the country districts in legislative and civic bodies should not overlook the fact that only prosperous companies operating in the cities can secure the capital to push lines into the rural sections. The country legislators will find upon investigation that they are properly interested in the welfare of the public utilities now operating in the cities."

"Incandescent Lamp Developments" was the subject of an illustrated talk by Ward Harrison, illuminating engineer of the National Lamp Works, Cleveland, O. For purposes of discussing city street illumination Mr. Harrison divided streets into three classes: business streets, thoroughfares, and residence streets. Business streets must be well lighted to prevent accidents, to discourage the operations of pickpockets and for purposes of display. People habitually frequent the best lighted streets of a city. In the case of thoroughfares, while there is need of good lighting, there is no attempt made at display. Residence streets require least light, though it should be such as to prevent traffic accidents.

To make the best of conditions under our present street-lighting systems, Mr. Harrison said, it is necessary to have an illuminant which gives off light at a high angle, generally 75 to 80 de-

grees. This causes glare, but light with glare is better than no light. The ultimate system of street lighting, Mr. Harrison believes, may consist in placing units so close together that they would direct the maximum candlepower to the middle point, and not have an angle of more than 75 degrees. This cannot be done with arcs, but with the newer Mazda the units can be divided with little expense. The tendency of central-station practice is toward putting in 400-candlepower lamps. Mr. Harrison believes that in the course of a few years they will double the number of Mazda units, and eventually make a jump to smaller units.

Mr. Harrison cited the remarkable progress that has been made in the field of electrical illumination by a comparison of the lamps of 1905 with the best types of today. Ten years ago 65 watts yielded 16 candlepower; today it is possible to produce 100 candlepower with the same wattage. By the use of prismatic refractors the candlepower can be raised to 200 at an angle of from 75 to 80 degrees. This means that the same wattage now may be made to produce ten times as much light as it did ten years ago.

Mazda lamps may now be substituted for alternating-current arcs. By so doing, Mr. Harrison pointed out, the power-factor of the current may be increased 65 to 90 per cent, which means an increase in capacity in kilowatts of about 45 per cent. In addition, a Mazda lamp of the latest type will give four candlepower per watt at 75 or 80 degrees, whereas the arcs gave only half the candlepower at the same angle. In other words, it is possible by means of the Mazda lamp to get seven times as much light from the same wattage, and it is possible at the same time to put 40 per cent greater wattage on a circuit. Therefore, for a given central-station capacity, it is possible to actually get ten times as good illumination on the street.

By making changes now and improving street illumination while the lamps are still new, Mr. Harrison said, central stations could increase their popularity with the people. In some cases the change from arcs to 400-candlepower Mazda lamps has been made without any advance in the rates of service and has proved profitable both to the municipality and to the central station. If, on the other hand, the central station takes the position that innovations are to be delayed as long as possible, the time will come when the people will demand improvement of service. Then they will see to it that the change is not profitable to the company.

"If the people feel that their electric light plant is fully abreast of the times, and is trying to give them the benefit of modern improvements in lighting," Mr. Harrison said, "they will be inclined to give the company kindly treatment in return."

The educational work the State University is capable of doing for the electrical interests of the state was the subject of an address by George D. Shepardson, professor of electrical engineering at the University of Minnesota. Interest taken in extension courses for electrical workers, which the university has been giving, has encouraged the authorities to undertake a plan by which several three-year courses of two evenings a week are to be offered, a certificate to be awarded to students successfully completing such courses.

A plan suggested a year ago by which it was proposed to send out lecturers for the purpose of placing practical information on the use of electric light and power before the people, Professor Shepardson said, has so far been a complete failure. At the time this plan was originated it was proposed that members of the electrical engineering faculty prepare lectures, and that central-station men provide for meetings. Letters were sent out to thirty of the most progressive central stations in the state, about half of which were municipally owned and half privately owned, suggesting that such an educational campaign might be beneficial in building up new business. Only two answers were received to the thirty letters, indicating, Professor Shepardson inferred, that the central-station men were not deeply interested.

In the discussion which followed Ludwig Kemper, of Albert Lea, and Leonard Peterson, of Thief River Falls, attributed the failure of the lecture plan suggested by Professor Shepardson to the fact that the average central-station manager is too busy to give a proposition of that kind the attention necessary to make a success of it. Experiences with other educational campaigns were cited to show that people are slow to attend lectures of an instructive character, even when they are given free. To make the popular lecture plan work out profitably for central stations, it was thought that it would entail a considerable amount of attention and because of the inability of the central-station men to give the necessary time to this work no arrangements were made for the lectures. Another effort will be made along similar lines the coming year.

The subject of "Central-Station Diversity-Factors" received comprehensive treatment at the hands of Prof. William T. Ryan, of the electrical engineering college of the University of Minnesota, whose paper opened the session on Wednesday morning. Professor Ryan took the definition of diversity-factor as given in the standardization rules of the American Institute of Electrical Engineers, where it is given as the ratio of the sum of the maximum power demands of the subdivisions of any system, or parts of a system, to the maximum demand of the whole system, or the part of the system under consideration, measured at the point of supply. Study of the diversity-factor for the various classes of customers is, Professor Ryan considers, a matter of great importance to the financial success of a central-station business, since it is intimately concerned with the design of the distribution system, and in the determination of rates for the different classes of customers.

Professor Ryan classified electric consumption into residence lighting, commercial lighting and general power. From exhaustive studies made elsewhere, Prof. Ryan said, the average diversity-factor among lamps for residence lighting is about 1.48; among meters for residence lighting about 3.35. Out of data obtained from 37 cities in Minnesota with populations varying from 3,000 to 220,000, Professor Ryan found the diversity-factor among residence consumers to vary between 4 (which was in a city of 220,000) and 2 (in a city of 3,700), the average for all the cities being 3.14. The average diversity-factor among residence lighting transformers was found by H. B. Gear, of Chicago, to be about 1.30. Professor Ryan's investigation in Minnesota showed it to be about 1.6, indicating that the number of customers per transformer is probably much smaller than in Chicago.

"There is a tendency in the small towns," he said, "to use too many small transformers instead of a few large ones. If we had 30 residence customers, each demanding one kilowatt, and we put in one transformer for each customer, our local transformer capacity would be 30 kilowatts, and the diversity-factor would be 3.35 among transformers; whereas, if we put in one transformer for the 30 residences, one 10-kilowatt transformer would suffice, and the diversity-factor among transformers would be about 1.30. One 10-kilowatt transformer would cost about $93, while 30 one-kilowatt transformers would cost about $600. The core loss of a 10-kilowatt transformer is 90 watts, that of 30 one-kilowatt transformers is 720 watts. Of course, on the other hand, the secondary distribution system will cost more and a nice balance must be struck between the two; the tendency, however, is to put in too many small transformers."

The diversity-factor among transformers used for general power purposes in Minnesota was found by Pro-

fessor Ryan to average about 1.6 as against 1.35, as found by Mr. Gear. The average diversity-factor among transformers in the Minnesota cities was found to be 1.60; in Chicago Mr. Gear found it to be about 1.33. Mr. Gear found that the diversity-factor among residence lighting feeders, commercial lighting feeders and general power feeders in Chicago averaged about 1.15; out of six replies from Minnesota cities Mr. Ryan found it to average about 1.21.

The kilowatt of station capacity per 100 kilowatts of residence lighting was found in the Minnesota cities to average 21.5; the kilowatt of station capacity per 100 kilowatts of commercial lighting average 62; and the kilowatt of station capacity per 100 kilowatts of general power averaged 48.5. Professor Ryan thinks fixed charges, such as insurance, depreciation and taxes, should be apportioned among the various classes of consumers in inverse proportion to their diversity-factor. In addition they should pay their share of the variable charges such as fuel, oil, lamp renewals, etc., which are fixed by the quantity of electricity generated. The investment and cost of operation to serve lighting customers, commercial lighting customers and power consumers may be determined with a degree of accuracy that is fair and equitable to each class. The individual within a class cannot be given a rate which is proportional to the cost of serving him. For these reasons, he believes there should be a demand and an energy charge, and that these charges must be worked out for the various classes of customers using the electricity, and that it is impractical to try to charge each individual customer within a class in proportion to the expense of serving him.

W. L. Wadsworth, meter inspector of the Minneapolis General Electric Company, discussed the subject of "Watt-Hour Meters." In the measurement of electrical current, he said, the practical application of efficiency is exemplified. As meters are subject to depreciation, they must receive regular and proper attention. The watt-hour meter, Mr. Wadsworth called the "keystone of success of an electric light or power company." The meter assigned to an installation should be suited to the voltage, frequency and character of the circuit, and should be chosen with a view to obtain the best adaptation to local conditions and load. The question of location of the watt-hour meter should be carefully considered in the first stages of carrying out an installation. Mr. Wadsworth appealed to those in position to do so to see that they have competent men in charge of their meters as a matter of wise business economy.

"As a general proposition," he said, "the securing of appropriations for expenditure in the meter department of a lighting company and the consequent saving effected, is quite a difficult problem compared with the ease with which figures may be obtained to warrant the installation of a new piece of generating apparatus or other labor-saving device." The reason is because of the difficulty of showing on the books the saving due to accurate meters.

Mr. Wadsworth thinks that if it were possible to keep meters commercially correct for the averaged load on the individual meter, and to keep all switchboard meters absolutely correct, the question that is causing the least worry, and at the same time probably costing most, would be solved; namely, that of distribution losses due to various causes, such as feeders of insufficient size, or faulty circuits; transformer performances in which losses occur by aging; poor design of the older types; lack of oil for proper cooling and over-transformer capacity installed on the lines; ground on lines and in transformers themselves; and finally, theft of current.

"Even the question of the most efficient light and power for the least money," said Mr. Wadsworth, "depends on meter upkeep, and applies equally to the customer consuming the power and the company producing it. The absolute knowledge that meters are correct places one on a better footing with customers and the good will thus gained is on a par with the best advertising."

As a result of the data obtained by the Meter Committee of the Minnesota Electrical Association, from 47 companies operating 88,825 meters, the committee thinks there is need in the state for a bureau to calibrate rotating standards and test watt-hour meter. Mr. Wadsworth suggested that the State University, in behalf of the many small companies in the state that are unable to maintain the proper standards in their laboratories, for the purpose of calibrating working meters, provide some means for having these working standards calibrated and adjusted.

In the discussion of this paper A. G. Munson, assistant superintendent of the electric department of the St. Paul Gas Light Company, said that efficiency should be the aim of every meter department, not only in the performance of meters, but in a special sense among the employees themselves. When a company places its meters in the care of a tester it must depend absolutely on his honesty for the safety of its revenue. Mr. Munson thought it would be better to put this work in the hands of a boy who has grown up with the company than to rely on a stranger, no matter how good his recommendations. He agreed that the most convenient, and, under proper conditions, the best method of watt-hour meter testing is by the use of a rotating-standard instrument.

Mr. Munson called attention to a bill presented to the state legislature for amending the law dealing with the theft of current. He appealed for co-operation in urging the passage of the bill, that being one of the ways the association is able to demonstrate its worth.

Following this an interesting lecture on "Resuscitation and First Aid for Electric Shocks and Burns," was given by Dr. E. H. Whitcomb, of St. Paul. As absorption takes place rapidly in wounds in which foreign matter has been lodged, Dr. Whitcomb advised the use of some simple, but effective, means of cleaning wounds. The pouring in of copious quantities of hydrogen dioxide was recommended for this purpose, since the action of this drug is to loosen and remove dirt particles. Proper care given in time to wounds that do not seem serious will often prevent the development of a case of tetanus.

According to statistics quoted by Dr. Whitcomb, the rate of electrical accidents is about 6.3 per 1,000 accidents. Many so-called electrical accidents, however, are due to falls through carelessness, or to carelessness with machinery. Electric burns are the most common kind of electric accidents. Next come accidents due to electric shocks.

Dr. Whitcomb explained the use of pulmotor for resuscition and demonstrated the usual first-aid methods. He placed greatest stress on the latter, because, while the pulmotor may have its advantages, there is always a delay in bringing it to the place where it is needed as well as necessity for an expert to operate it. The hand method may be put into operation the moment the accident occurs, and he advised the members of the association to familiarize themselves with it.

The afternoon session on Wednesday was opened with a discussion of the subject of "Proper Electrical Installation," by Oscar M. Frykman, city electrical inspector, Minneapolis. Mr. Frykman said that in recent years considerable time and thought has been devoted to this subject by the underwriters and others directly interested on account of the enormous losses by fire due, or supposedly so, to "defective wiring." The need of a standard for the guidance of workers has resulted in the development of the National Electrical Code, which is now published biennially and distributed by the National Board of Fire Underwriters. Most of the large cities have inspection departments which either use the

Code, or are governed by ordinances more or less like it. In smaller cities and villages the central stations detail men for this work. To obtain proper electrical installation an inspection system is necessary.

Mr. Frykman placed the methods of installation in six classes: (1) concealed knob and tube; (2) open cleat or knob; (3) wood molding; (4) metal molding; (5) concealed iron conduit; (6) open-iron conduit. The three latter he termed fireproof electrical construction and safe under ordinary conditions. Wood molding is unsuitable and prohibited in many cities on account of the fire hazard. It is particularly unsuited to damp places, such as meat markets and laundries, and in places where nails are liable to be driven into it, cutting the wire and causing an arc with disastrous results.

Cleat wiring Mr. Frykman characterized as satisfactory where it is not subject to mechanical injury, as in rooms with high ceilings where nothing is handled that is liable to disturb it. Our modern buildings with their numerous pipes for gas, plumbing and heating, etc., leave little room for knob-and-tube wiring, especially under rules requiring them to be placed at least five inches apart.

The practice of allowing rubbish and shavings to remain in cracks in the rough floors of new buildings is another source of danger to be overcome in wiring. If the wires become imbedded in such combustibles trouble is liable to result, unless the wires are protected by conduits which, Mr. Frykman said, is the only satisfactory method of wiring. When break-downs do occur the arc is then confined in the conduit and not exposed to inflammable material, unless, of course, the circuit or feeder is improperly fused.

The subject of grounding the secondary neutrals, Mr. Frykman said, has been discussed probably more than any other. In Minneapolis it was advocated for five years, but without success until recently when the sanction of the water department was finally obtained for the use of the mains. "We believe that a poor ground is worse than none," the speaker said, "and no city ought to require grounding unless it can offer its water mains for that purpose. On a 3-wire, 110 to 220-volt system with effectively grounded neutral there ought not to be a dangerous use of potential in case of a transformer having its insulation punctured."

Another precaution recommended was the requirement of porcelain sockets over cement and other conducting floors near sinks, gas stoves and in bath rooms. In case of objection to porcelain socket, keyless brass-shell sockets controlled by a switch may be substituted, or even a chain pull with insulation on the chain.

An exhaustive discussion of the latest tendencies and developments in street lighting and incandescent lamps, together with slides illustrating the points, was given by S. L. E. Rose, of the illuminating engineering laboratory of the General Electric Company, Schenectady, N. Y. The refractor, Mr. Rose said, is one of the greatest advances in light reflecting devices. It has a distinct field in street lighting and will, Mr. Rose believes, be greatly used in incandescent units of relatively low candlepower, and on the larger incandescent units and arc lamps where the conditions necessitate the large spacing of units and where they may be hung high. As an illustration, the speaker said existing installations of old carbon arc lamps, with one every 400, 600 or 800 feet, may be replaced by incandescent lamps of 250 to 400 candlepower, equipped with refractors, with a distinct gain in illumination.

Any street could be well lighted, Mr. Rose said, with any illuminant available, if it were not for the external factors that enter into the problem. There is always a best location for each unit and for different equipments of the same unit, and it would be a simple matter to calculate the height and spacing which would give the best results for a unit with a particular candlepower distribution if illumination were the only consideration; but local conditions, as well as psychological and physiological aspects, may so confuse the problem as to upset calculations entirely. One might calculate that the best height for a particular installation would be 25 feet; but trees and foliage might so interfere with light from the unit that the result would be poor illumination on the street and sidewalks.

The factors which determine the system of street lighting best adapted to a given locality are controlled to a large extent, in Mr. Rose's opinion, by local conditions which are best known to, and can be best handled by the central station, whether under long or short-term contract. These factors are maintenance, energy, first cost, reliability, suitability, etc. The lighting unit should give a suitable distribution of candlepower for the conditions under which it is used; should have reliability of operation, so as to have as few outages as possible; should be economical to maintain and pleasing in appearance. If all these are given consideration with the numerous units available today, Mr. Rose thinks the street lighting in the country would be materially improved in the next few years.

In conclusion he said that the standard of illumination is being continually improved which is natural, as more efficient lighting units are developed, enabling us to get more light for the same money. Street lighting, as in many other things, is a case of dollars and cents. The city or town appropriates so much money for it and the problem of using this money to the best advantage is not a simple matter, but requires study, thought, and co-operation between the city and the central station supplying the service, in order that the best results may be obtained.

In the discussion following Mr. Rose's paper it was brought out that the tendency of the day is away from clusters in "white way" lighting, to posts of not more than one or two lamps. The people have begun to feel that the cluster is too bright and that single-light units placed at moderate distances apart are better. Posts of about fourteen feet in height placed at intervals of 80 to 90 feet with a single lamp of from 400 to 600 candlepower are regarded as most popular at the present time, according to the opinions of those taking part in the discussion.

In an illustrated talk on "Incandescent Lamps and Lamp Testing," Preston S. Millar, of the Electrical Testing Laboratories, New York, demonstrated how this work was done, and said for the central-station man to neglect the incandescent lamp was to court trouble. While in recent years the power load has become a greater factor than the lighting loads, Mr. Millar said, the lighting load retains importance because of the fact that it is distributed among a larger number of customers, and satisfied customers, whether large or small consumers, are always an asset.

In some cities central stations are supplying the lamps to their customers either as a part of their service, or in competition with other concerns. A defective lamp will go far toward nullifying all the efficiency that good management and thorough work has been able to make possible on the other side of the meter. Hence the need for the central-station man to see that the lamps he serves are of the best type and quality.

"Friendship as a Factor in Load Building," was discussed by W. N. Matthews, Twelfth Jupiter of the Jovian Order, president of the firm of W. N. Matthews & Brother, St. Louis. Mr. Matthews said it is the man who has the faculty of making friends that will get the business in electrical service as in every other department of endeavor. Every official and employee from the president of the company to the office boy should school himself to be courteous to those with whom he has dealings. Only efficient men with

good personality should be chosen to deal with the public. There is no advertising, Mr. Matthews said, that is more effective than that which is obtained through friends.

Mr. Matthews told of the work the Jovian Order is doing for the electrical industry. Many firms, he said, find it profitable to pay the dues of their men in the local Jovian league, because of the advantages resulting through their employees having an interest in common.

He advised the heads of firms to make access to their office as easy as possible by eliminating all red tape; to solicit suggestions for improvements; to be cheerful and kindly toward those serving under them. "Serve," he said, "in an efficient and cheerful manner and your customers will become your best friends."

The final session of the convention, Thursday morning, was opened with a paper on "High-Tension Outdoor Substations," by H. W. Young, president of the Delta-Star Electric Company, Chicago. Mr. Young made the point that many high-tension transmission lines pass through districts in need of electric service, and many residents in such districts are ready to pay a reasonable price for it. What then can the central-station manager do to secure loads which will prove profitable and attract the investing public? The obvious answer, Mr. Young believes, is the low-cost outdoor self-contained substation. He did not wish to be misunderstood as saying that a group of small consumers can always be made profitable customers, especially if it entails the building of long lines. But assuming that the lines are built, by means of the substations, power may be sold to those whose houses, farms and mills, etc., border on the lines.

A substation to operate successfully, Mr. Young said, must not interfere with the operation of the main line; disturbances due to short-circuits, lighting, etc., must be localized; the cost per kilowatt must be low; the construction such that the capacity may be increased by simply changing transformers and fuse capacities; essential elements must be in plain sight; installation must be safe, fireproof and easily operated; the design must be such that the station may easily be taken down and set up elsewhere. The outdoor substation, Mr. Young said, has been perfected to meet all these requirements. He advised the use of standard, or ready-made stations whenever possible in preference to special designs.

"The standardization of the steel-tower outdoor substation," said Mr. Young, "is of real importance to the user, as it eliminates the chance of error which is always present when such equipment is designed by local men."

Mr. Young illustrated by means of photographs the different types of switches, fuses and lightning arresters and the latest means developed for handling substation transformers. The claim is made, he said, that the farmer or small community is slow to take up the use of electricity. He opposed this claim by pointing out what has actually been accomplished in placing the automobile in these fields, and added that the desire for electric service only needs stimulation. Once its conveniences, decreased fire risks, and real economy are understood the way is open.

Sales spirit, Mr. Young believes, to be one of the principal factors in increasing transmission-line revenues. Indifference to this is one of the leading obstacles to increase of business. "It is not good policy to spend all the time in securing new customers," said the speaker, "as the present ones can be educated to materially increase their consumption of current. Electric service has given civilization a tremendous impulse for the better. The telephone and telegraph are coming rapidly within universal reach of the rural population. Electric light and power is also coming to the front and soon will be counted a factor in the advancement of civilization conveniences."

In a discussion of Mr. Young's paper, B. W. Cowperthwait, manager of the Consumers' Power Company, Fairibault, stated that his company is doing some business with farmers, and a considerable business with small towns. Ludwig Kemper, manager of the Minnesota Gas & Electric Company, Albert Lea, stated that he has been selling small generating plants to farmers in his territory. He has begun to interest the farmers in organizing local companies and building lines through which they may be served. When the lines are built his company will maintain them and furnish the electric service. Mr. Kemper said he hopes to see something realized along these lines the coming summer. He believes the farmers are willing to bear the expense once they are assured of the safety, convenience and value of the service.

The concluding address of the convention was given by D. D. Lescohier, chief statistician of the Minnesota State Labor Bureau, on the "Achivements in Accident Prevention." The decrease in fatal accidents in the state in the last four years, he said, has resulted in the saving of more than 400 lives. This has resulted, not from the addition of safety devices or improved machinery, but from education and co-operation. People are accustomed to attributing accidents to machinery and high-voltage electric power, said Mr. Lescohier; while statistics show that in Minnesota less than 20 per cent of the accidents are due to those causes. The money invested for safety devices and the time spent in promoting an interest in safety among employees, declared Mr. Lescohier, has been found in every instance to yield handsome dividends.

Officers for the ensuing year were elected as follows: President, T. D. Crocker, assistant manager of the Minneapolis General Electric Company.

First vice-president, J. C. Bang, manager of the Madison, Minn., municipal plant.

Second vice-president, J. W. Peterson, manager of the Fergus Falls municipal plant.

Secretary-treasurer, F. A. Otto, superintendent of the electric department of the St. Paul Gas Light Company.

Board of directors: R. E. Brown, manager of the Consumers' Power Company, Mankato; R. F. Pack, manager of the Minneapolis General Electric Company, and Ludwig Kemper, manager of the Minnesota Gas & Electric Company, Albert Lea.

A banquet was given Tuesday night by the electric dealers and manufacturers of Minneapolis and St. Paul, which was attended by nearly 300 guests. The mayor of St. Paul was the principal speaker, and besides several other addresses a program of music and vaudeville was given.

Exhibitors at the convention occupied almost an entire floor of the St. Paul Hotel. Many of the exhibits were elaborate and attracted considerable attention. Exhibitors and their principal exhibits were as follows: Electric Appliance Company, Sangamo meters, miniature of Delta-Star substations; St. Paul Electric Company, lamps, washing machines and household devices; Westinghouse Electric & Manufacturing Company, recording meters and other devices; General Electric Company and the Lamp Works of the General Electric, small motors, meters, lamps; Electric Service Supplies Company, lightning arresters; Adams-Bagnall Electric Company, fans, industrial street-lighting fixtures; Northwestern Electric Equipment Company, dynamos, lighting fixtures; Landers, Frary & Clark, household devices; Electric Engineering Company, washing machines, motors; Peerless Electric Company, household devices; Federal Sign System (Electric), signs; Bryan Marsh Company, lamps; Julius Andrae & Sons, flatirons, lamps; Finley Electric Company, motors and fans; Western Electric Company, washing machines; fuses; Page & Hill Company, cedar poles; Duncan Electric Manufacturing Company, meters, transformers; Beebe Sales Company, electric washers; Sterling Electric Company, weather-proof wire.

## WELL DESIGNED CENTRAL STATION IN A SMALL TOWN.

### Electric Plant at Durand, Ill.

There are still a very large number of small towns in all parts of the country located at points more or less remote from electric power transmission lines. Such towns have not been able to avail themselves of the benefit of electric service, unless they depended on a local generating plant. Despite a steady increase in the network of transmission lines, such local plants will doubtless continue for a long time to be the chief source of power supply in rural communities. The following discussion will deal particularly with towns of about one thousand inhabitants or less, and will be illustrated by a well designed plant in a town of about six hundred.

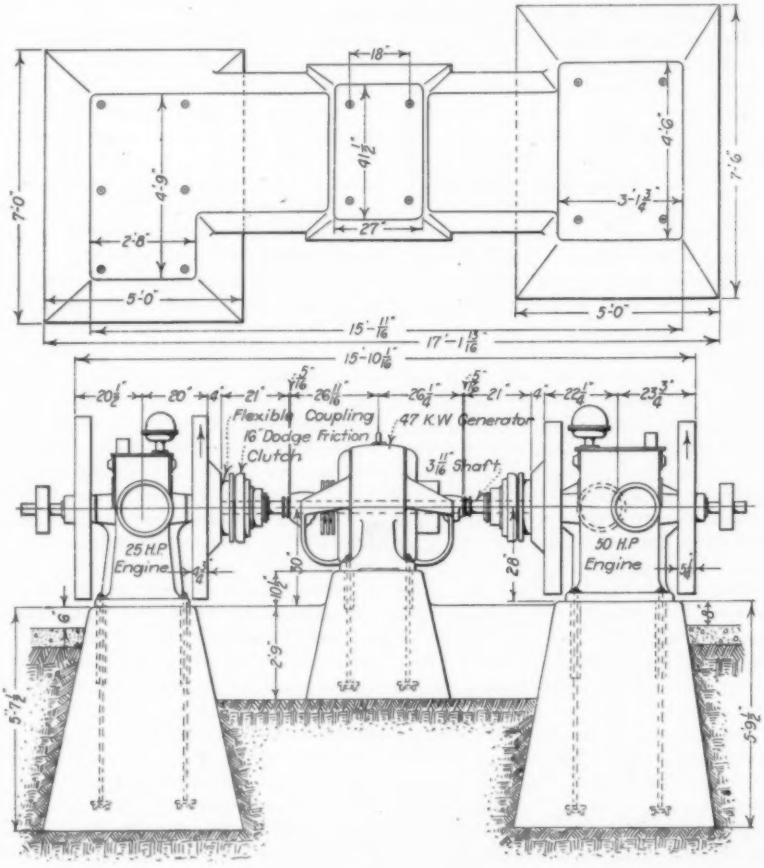
In order to supply fairly reliable service at reasonable rates, definite engineering requirements should be met in the design of such small plants. These requirements are, in the usual order of their importance, simplicity of equipment, low first cost, low operating and maintenance cost. The reasons for this are evident from the conditions prevailing. Highly skilled engineers needed to take care of elaborate equipment are not available in the country. The investment must be kept relatively low, else the meager profits will not meet interest charges. For the same reason, the operating costs must be kept down. Therefore, the efficiency, in so far as it affects the fuel cost, should be as high as is consistent with the other requirements.

In the selection of the prime mover, the foregoing requirements practically eliminate the steam engine with its auxiliary boiler and furnace, since the internal-combustion engine of simple design gives a much more compact and less expensive plant, is more easily taken care of, and has a higher efficiency and lower operating cost. If a gas engine were used, however, the need for a gas producer in any but a natural-gas district, would reduce the advantages of simplicity of the internal-combustion engine over the steam plant. The gasoline engine is out of the question for any but the smallest plants, on account of the relatively high cost of fuel. The oil engine, using a comparatively unrefined grade of fuel, seems therefore to be best adapted for this purpose.

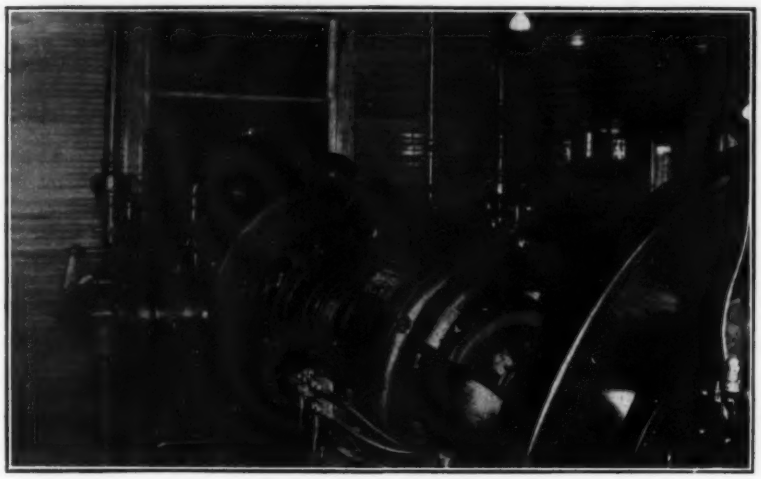
The design of the electrical part of the plant is not difficult. If the town is fairly dense, and outlying extensions are not contemplated, direct-current equipment will naturally be chosen. If the town is scattered and rural lines are to be built, alternating current will be selected. In either case the generator is of simple and well standardized construction. The station wiring and switchboard for a small plant are not complicated. Electrical operation is simple and reliable, in fact doubtless more so than the operation of the internal-combustion engine. The necessity for standby equipment to insure reliable service is therefore more urgent as regards the engine than the generator.

All of the ideas set forth above are exemplified in the central station recently completed and put in operation for the Durand Electric Light Company in the village of Durand, Winnebago County, Ill. Walter Bliss, the enterprising son of a prosperous farmer, is the owner of the new establishment. With the aid of a few workmen, he built the entire plant, including also the distribution lines throughout the village. Mr. Bliss conceived the idea of not only furnishing central-station service for the village, but of building as auxiliaries of the plant an automobile garage and a general repair shop, all three of these features being greatly needed in the community, which has some 600 population. Thus there are concentrated in a single plant, located in the center of the village, and adjoining the tracks of the Chicago, Milwaukee & St. Paul Railway, all of the electrical and mechanical utilities of the community. In order to take care of these various undertakings with the minimum number of employees, it was necessary to select very simple and reliable apparatus.

A single structure, 64 by 50 feet, houses the electric plant, garage, repair shop, general office and store rooms. The garage occupies the east half of the building and the repair shop the southwest corner. The engine room is in the northwest corner and is only 15 by 24 feet in floor area, on account of the compactness of the generating machinery layout. This compactness is obtained by using direct-connected drive instead of belting between engine and generator; another reason for eliminating belting was to avoid belt losses and dangers. Two oil engines with a single generator between them are placed in a single line, as shown in the accompanying plan and elevation of the machinery layout. The overall length of the group between the outer flywheels of the engines is only 15 feet 10 inches. The accompanying half-tone illustrations give only an imperfect idea of the engine room, on account




Foundation Plan and General Elevation of Durand Plant, Showing Machinery Layout.



View in Durand Plant, Showing Generator and Larger Engine.

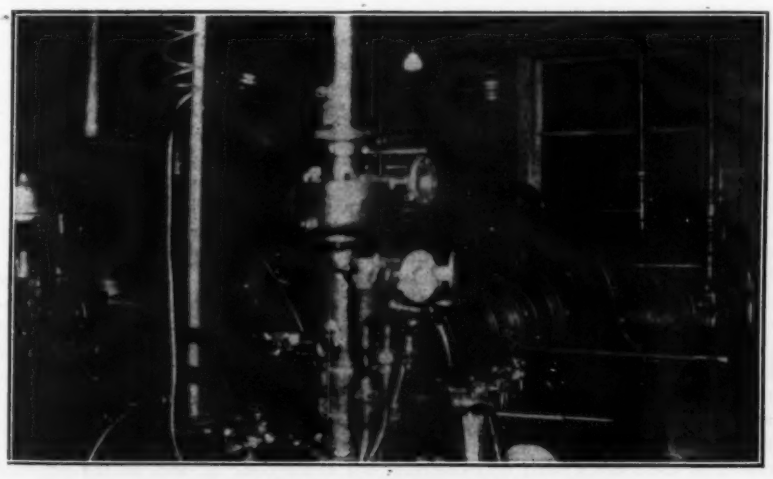
of difficulties experienced in taking photographs.

In selecting the equipment, it was decided to use oil engines of simple design in connection with a 220-volt, three-wire, direct-current generator. The latter is a standard type of machine of good efficiency at practically all loads, fair overload capacity, and sufficient reliability to require no reserve unit. All oil engines, however, like other internal-combustion engines, do not have good efficiency at low loads, particularly below one-third load, and the overload capacity is restricted to about 10 to 15 per cent above rating; from about three-fourths load to full load the efficiency is very high, however, making it very desirable to operate at this point.

At first it was contemplated to run the new plant each evening until 11 or 12 p. m., later to provide also partial day service several days a week, then every day, and finally full 24-hour service throughout the week, as the public would become educated to the use of electricity. It was expected that for much of the running time the load would be rather small, and therefore unfavorable to good operating performance if a single oil engine were used. Therefore, it was decided to provide two engines, one of 25 and the other of 50 horsepower, these to be arranged to drive a single generator independently and interchangeably, or both together at the same time. This was conveniently done by means of direct drive through friction clutches.

The scheme of operation is to run the plant by means of the 25-horsepower engine until the load rises to about 16 kilowatts, corresponding to full load for that engine. On futher rise of load the 50-horsepower engine is started up and connected to the generator by means of its clutch; the small engine is then disconnected and shut down, the large engine carrying the load until this rises to about 32 kilowatts. When the load increases above this point the small engine is again started and connected in, both engines then carrying the load jointly up to slightly above the full-load rating, which is 47 kilowatts for the generator, corresponding to 75 horsepower on the engines after allowing for internal losses. As the load decreases again, the reverse order of operation is carried out. This method of operating has proven to be very flexible and to fully meet the requirements of good general efficiency at all points. The engines are easily started, either through the residual compressed charge in the cylinders, or by compressed air, and quickly brought to speed, which is 350 revolutions per minute, through the automatic action of the governors. Connection of the engines to the generator shaft is readily effected through the flexible couplings and friction clutches.

View Showing Generator and Smaller Engine.



View Showing Operating Valves and Clutch Levers.

The engines are of the Mogul horizontal-cylinder, inclosed-crankcase, four-cycle type. The 25-horsepower unit has one cylinder and the 50-horsepower machine two cylinders of identical construction. In nearly all respects, the essential parts of the two

engines are interchangeable, which makes it unnecessary to carry many spare parts of different sizes in reserve. In case of breakdown of any parts, the other engine carries the load while the single spare piece kept on hand is used to replace the broken or deranged part. This largely eliminates the confusion resulting from any emergency and greatly facilitates getting things into normal condition again.

An ingenious cooling system is used for the engines. The cooling water circulates automatically through convection currents due to heating in the jacket about the cylinder. As the jacket water rises to 212 degrees Fahrenheit, steam is formed and carries over a quantity of water from the vertical riser through the horizontal connecting pipe to the cooling tanks on the west wall of the room. The quantity of water and its level is regulated to make this circulating action automatic and continuous, so that the jacket water is always kept at a little below 212 degrees. This produces uniformity of cylinder temperature at a sufficiently high point to secure proper vaporization of each injected atomized fuel charge, and it promotes fuel economy from the elimination of oil condensation on chilled cylinder walls. In winter the warm water is used in a number of radiators in the office and other parts of the building for warming the different rooms, then returning again to the engine cylinders in a continuous circulating system. For fuel there can be used what is termed petroleum distillate, kerosene, or gasoline. At present kerosene at 6.5 cents per gallon is used. The governor and most of the engine parts are inclosed. This makes the machine quiet-running and prevents splashing and waste of oil. Each engine has two heavy flywheels to maintain uniformity of angular velocity. A pulley at the free end of the smaller engine permits belting to an air compressor and to a short line shaft that drives a group of machine tools in the adjoining repair shop.

The generator is a Triumph 220-volt machine compounded for constant potential, and arranged for three-wire operation by means of an external balancing transformer connected to the collector rings on the armature shaft; the commutator is on the other end of the shaft. Wiring from the generator to the switchboard is in conduit passing through the cement floor. The switchboard is mounted in the partition wall between the engine room and office, so that its back is in the former room and its front in the office.

The plant has been operating steadily and without any trouble since last November. While the load was naturally small at first, it has gradually increased as more customers were taken on. All current is sold on a meter basis, at 15 to 12.5 cents per kilowatt-hour for private customers and at 13 cents per kilowat-hour for village street lighting.

The entire power-house equipment was supplied and installed by the Tractor Works of the International Harvester Corporation, Chicago, Ill. The oil engines and flexible couplings were built by the above works. The generator was manufactured by The Triumph Electric Company, Cincinnati, O. The friction clutches were made by the Dodge Manufacturing Company, Mishawaka, Ind. Switchboard equipment was made by the General Electric Company, Schenectady, N. Y. The watt-hour meters used are the product of the Duncan Electric Manufacturing Company, Lafayette, Ind.

## Electric Cooking.

W. R. Cooper, who has been bringing the subject of electric cooking, considered mainly from the consumer's point of view, before London and provincial meetings of the Institution of Electrical Engineers, insists that it is increasingly important that the matter be watched from that point of view.

He thinks it would be an excellent thing if central-station managers were compelled to employ electric cooking exclusively in their homes and also to pay for the energy so consumed. "This would not only familiarize them with the apparatus, but would show them the defects of some of the tariffs that they try to inflict on other people."

Mr. Cooper does not look upon the electric heating of domestic water as a proposition that is financially impracticable. He considers it a question of rates. With thermal-storage apparatus a practically continuous load can be obtained, and assuming that electricity is already being supplied, it should be feasible to make a quarterly charge for a water heater of given input, on the basis of continuous use at the rate of a half cent per kilowatt-hour.

In discussing details of cookers and losses in cooking, the author said that whether an economical result was obtained in cooking depended largely upon the cook, and therefore things ought to be made easy for her as regards control. For this reason he advocated the fixing of a main double-pole switch in a handy position near the cooker, a pilot light being also fixed so that the cook could not help seeing whether the power was on or off. She should be trained to cut the supply off at this main switch in addition to the subsidiary switches. The placing of a pilot lamp under a small red window fitted to the casing of the cooker itself was scarcely sufficient to attract attention. An ordinary glow lamp on the wall compelled attention and was noticed by anyone entering the kitchen casually, so that supervision was made more easy. Whether it was desirable to carry the principle further and have a pilot light for each part of the equipment was considered open to question. The author did not think it desirable to go into that complication provided the switches were well illuminated, but he felt it was most important to have the branch switches in a position where they were not only easily seen, so that the various heats were ascertainable at a glance, but also so placed that they were easily operated. Notwithstanding the advantage of making the cooker and switches a combined and complete unit, he thinks that switches are best placed on the wall behind the cooker, somewhat to one side.

Mr. Cooper's experience leads him to approve of the provision of a thermometer in the oven door, and he gave figures to show the waste of current that would occur in waiting for heating up to a required temperature long after such a temperature was reached.

## Design of Interior Lighting Fixtures.

The Illuminating Engineering Society of London on February 16 considered some notes by F. W. Thorpe on the development and design of the lighting fixtures in relation to architecture and interior decoration.

He suggested that in dealing with interiors of a distinctive period the appearance of the fixture was just as important as the illuminating efficiency. In such cases it was best for the architect to select the type of fixture; ensuring, by cooperation with the engineer, that it embodied modern practice as regards efficiency. In industrial lighting, such as printing offices, factories, etc., these were best arranged by the illuminating engineer, who should be consulted by the architect. Where it was desired to preserve the correct atmosphere of an old period room it was permissible to reproduce the fixtures of the particular period, remodeling them carefully to present ideas, which could be done without incongruity. With a modern room making no claim as to purity in style, any system of lighting and type of fixture was permissible as long as adapted to the practical requirements of the room.

It was sometimes advisable to consider the method of illumination before designing the room, as various systems of lighting were best adapted to enhance certain schemes. The above considerations pointed to a much needed co-operation between the architect, the engineer and fixture designer, with a view to raising the artistic as well as the practical aspects of illumination to a higher plane.

## Meeting of Jovian Congress in Chicago.

Members of the thirteenth congress of the Jovian Order, together with members of the Past Jupiter's Association, met in Chicago on March 18, as the guests of Homer Niesz, reigning Jupiter. Following a dinner at the Hotel LaSalle, a business session was held at which pertinent matters relating to the organization were discussed. During the dinner Jupiter Niesz was presented with a silk umbrella adorned with a silver-mounted handle.

In order to stimulate the various statesmen and their lieutenants to greater efforts in securing members, it was decided to establish a certain figure as representing the minimum number of candidates that must be obtained within a given administration; pro rate this number among the congressional districts, states and cities, basing the number alloted to each with due regard to their electrical population and Jovian membership already obtained. Hereafter, the award of the degree of Jovian Merit will be based upon whether the officers reach the allotment made to them.

Attention was called by W. E. Robertson to the large field of latent candidates among the wiremen and electricians and others engaged in practical work, to reach whom no efforts have previously been made. It was decided to encourage the acquisition of these men to the ranks.

Because of the growing importance of the work undertaken by the Commercial Division, it was decided to create an individual commercial membership, involving the payment of annual dues entirely separate from the regular dues of the Order. Members in the Commercial Division will be known as "Vulcans," and membership will be indicated by placing the letter "V" after the potential number. Dues were established at $10 per annum.

The matter of accident insurance was discussed and efforts will be made to provide insurance for members at a rate lower than could be obtained individually. It was also unanimously agreed that upon invitation the Jovian Order should co-operate to the fullest extent with the Society for Electrical Development in promulgating a national electrical week.

## Chicago Jovian League.

A. F. Sheldon, of Chicago, delivered an address on "Service" before the Chicago Jovian League on March 29. He gave as a fundamental formula for "service:" quality plus quantity plus mode of conduct and discussed each of these subjects, pointing out the equal importance of all in achieving success individually or as a business.

## Electrical League of Cleveland Establishes Precedent in Electrical Organization Circles.

There is probably no local organization of electrical men which has been able to accomplish more in the way of general educational development than the Electrical League of Cleveland.

At a meeting of the allied electrical industries of Cleveland held in October, 1909, the foundations were laid for the building of the splendid organization which exists today. For the first four years all energy was directed toward building and strengthening the organization until in 1912 the League entered the National Electrical Jobbers' Association. After that time, national recognition was slowly but surely secured.

One notable achievement was the winning of the special prize of $500 offered by the Society for Electrical Development for securing the largest number of members to the Society.

Probably the next important epoch in the League's history was the successful culmination of the Electrical Exposition held in Cleveland in May, 1914. This show was one of the largest and most comprehensive that has ever been held in the United States, and from an educational standpoint, familiarized thousands of people with present-day electrical devices.

The latest accomplishment of the League is the establishment of permanent headquarters in the Hollenden Hotel. Three large rooms, composed of a lounge, a lobby and a dining room which will seat 150, and a small room for committee meetings, were formally opened on November 19, 1914. The rooms are richly and comfortably furnished and in charge of a secretary from 8:30 a. m. to 10:00 p. m.

The League serves as the Cleveland Chapter of the Jovian Order and the Cleveland Section of the Electric Vehicle Association of America. Thirty-five active committees are taking care of the interests of the membership which represents 125 of the progressive electrical firms of Cleveland, and which totals an individual membership of over 500.

On Thursday, March 18, the League with the members of the American Institute of Electrical Engineers as guests, listened to an address at a noon luncheon by Samuel McMeen, president of the Columbus Railway, Light & Power Company and the Ohio State Telephone Company. On Thursday, March 25, the members attended a luncheon at the main office of the Cleveland Telephone Company, after which an inspection tour of the building was made in conjunction with employees of the telephone company acting as guides.

## LETTER TO THE EDITOR.

### Lifting Magnet for Submarines.

*To the Editor:*

Notwithstanding the heroic efforts that have been made for rescuing the unfortunate inmates of the F-4, the task will remain unaccomplished, as far as human intelligence is able to conclude from the latest reports received.

The means employed for raising the sunken submarine are thoroughly inadequate. In the first place, much time is lost in locating the vessel. Furthermore, the complex task of attaching the chains renders the whole procedure most precarious. A give, a slip, and the work of hours and hours has all been in vain. Lives that might have been saved are doomed and the nation will have to lament the loss of heroes, whose terrible ordeal it is impossible to imagine. They have become the martyrs of old and inadequate methods.

It seems strange indeed that powerful and specially constructed lifting magnets—capable of dealing with such a task—should not have been available, both for locating the F-4 and for raising the vessel to the surface. It would seem quite reasonable to assume that this method might accomplish as much in minutes as the old method is capable of achieving in hours or even in days. If, therefore, I plead the cause of the 21 victims, then I do so in the hope that all concerned will take up this matter energetically and without loss of time in order to forestall as far as humanly possible any further calamities and disasters of this kind.

H. J. Herberts.

New York City, March 28, 1915.

## Minneapolis Jovian League Meeting.

W. N. Matthews, Twelfth Jupiter of the Jovian Order, president of W. N. Matthews & Brother, St. Louis, was the principal speaker at a meeting of the Minneapolis Jovian League at the Rogers Hotel, March 23. Mr. Matthews took as his subject "What You Get for Your Money," and said his experience in the Jovian Order has been that the members get good dividends on their investments in Jovian work. One of the direct benefits, he said, is often the elimination of disastrous enmities among business men. "The good the Order has done in bringing electrical men together to their mutual benefit," said Mr. Matthews, "is not to be estimated."

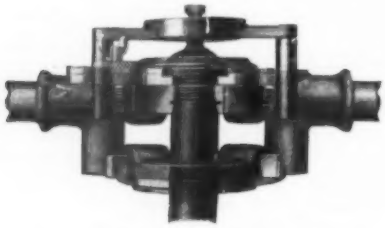
J. B. McMullen, statesman-at-large, from Tomah, Wis., addressed the league on the motto of the order, "All Together, All the Time for Everything Electrical." He urged the men to take the work of the Order seriously and make it mean something in their lives.

# New Electrical and Mechanical Appliances

## Beaver Cross-Bar Die Stock.

The new cross-bar die stock is an addition to the line of Beaver easy working die stocks manufactured by The Borden Company, Warren, O. This tool threads one-half to one and one-fourth inches. It operates on a very unique principle.

This die stock differs from other similar tools in that it has a bar extending across the top of the tool carrying a plug which rests on the end of the pipe. The dies are made in two sections. The lower section does the rough work of starting on the pipe with teeth especially formed for this purpose, so it is always easy to start the thread. The die remains stationary during starting. After the upper section begins to cut, this lower die gradually withdraws from the pipe, until it no longer touches, as shown in the illustration. The upper die is a narrow receding die and constantly opens as the thread is cut, producing a perfect standard pipe thread on the well known Beaver principle of continually cutting out less metal, the further you thread the easier the labor. These dies have the further advantage of following the partial threads cut by the first section, which still further reduces the labor and insures correct thread pitch without a leader screw.



Cross-Bar Pipe-Threading Tool.

The principle involved can be explained as follows. A swiveled plug extends down between the dies to the bottom of the upper section in starting. The pipe is started and threaded as usual; when the work of the lower stationary die is completed, the pipe end comes in contact with the swiveled plug, raising it as the second set of dies cut the thread. Raising the plug lifts the side posts, turns the engaged die cam, and gradually opens the dies at pipe taper until the thread is completed, when the dies are released without backing off.

The operation of the tools is extremely simple. The dies are set by the handle shown, and the pipe threaded without attention by the operator. To cut another thread the cross bar is simply pushed down.

The body of the tool is made of practically one piece with wide openings to allow chips to get away and for free oiling facilities.

A universal guide centers all sizes one-fourth to one and one-fourth inches. The tool is regularly furnished with double-ended reversible dies one-half to one and one-fourth-inch; extra one-fourth by three-eighth-inch dies can also be furnished and all sizes of dies either right or left hand.

## New Hubbell Flush Receptacle.

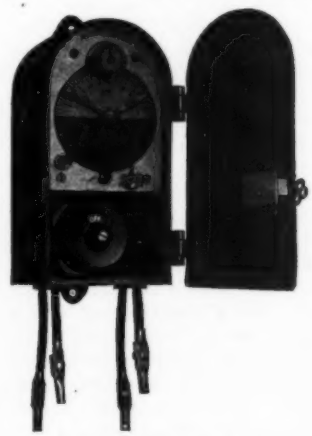
The firm of Harvey Hubbell, Incorporated, Bridgeport, Conn., has added to its extensive line of receptacles a new type known as the Hubbell flush receptacle with recessed plate. As shown in the illustration, this permits inserting the cap or plug so that the top of the latter is flush with the plate and does not protrude from the wall. The plug has an unusually deep insertion. The receptacle is provided with the new type of T-slot contacts by means of which 17 different types of plugs or caps can be interchangeably used. The usual Hubbell standards of design and workmanship are followed in every feature of its construction.

Receptacle With Recessed Plate.

## Anderson Time Switch.

For some time there has been an increasing demand for a compact time switch of moderate cost and current capacity sufficient for small signs and similar circuits where automatic control is desirable. To meet this demand there has been placed on the market by the Albert & J. M. Anderson Manufacturing Company, 289 A Street, Boston, Mass., the type of switch illustrated herewith. This switch is made in five and ten-ampere sizes for 250 and 600-volt circuits.

The outfit includes the standard clock mechanism and indicating snap switch which have become well known in the larger sizes of Anderson time switches. Every part of the mechanism is made in the company's plant and of the same high grade as has characterized Anderson products in general. One type of these switches is made in double-throw form for use with two-rate meter service. The 250-volt, 10-ampere switches are single throw and made either two-pole or three-pole. The 600-volt switch is a five-ampere, single-pole, single-throw switch.



New Time Switch.

## Price Reductions in Edison Mazda Lamps.

Practically all the sizes and types of Edison Mazda multiple lamps are affected by reductions in list prices that were put into effect on April 1 by the Edison Lamp Works of General Electric Company. On the regular straight-side and round-bulb lamps, from the 10-watt to the 250-watt sizes, also on sign lamps, stereopticon lamps, etc., the reductions range from 3 to 20

cents per lamp, according to the size. These reductions, which average about 10 per cent, will tend to popularize still further these already popular lamps.

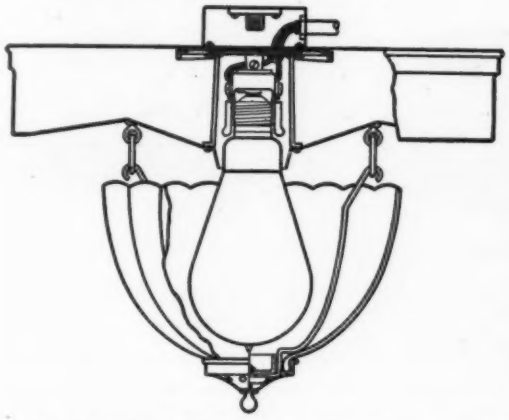
The new concentrated-filament vacuum lamps of 25, 40 and 60-watt sizes now list at only five cents per lamp more than the regular lamps of corresponding sizes.

On the gas-filled, multiple lamps of 100 to 1,000-watt sizes, the reductions range from 50 cents to $1.00 per lamp, the average reductions being between 20 and 25 per cent. The introduction of gas-filled lamps has been exceptionally rapid. Over a million are already in use. The decreased cost of these lamps will undoubtedly result in a still more rapid replacement of vacuum lamps by the more efficient gas-filled units.

## New Semi-Indirect Lighting Fixture.

In the accompanying illustration is shown a cross-sectional view of a semi-indirect lighting unit recently developed and patented by the Frank Adam Electric Company, St. Louis, Mo.

The fixture is equipped with a top reflector, the surface of which consists of two independent reflecting surfaces,



Partial Section of Semi-Indirect Fixture.

which are disposed at a slight angle to each other and also with the horizontal plane. The surface of the outer portion of the reflector is arranged at such an angle that the rays are projected outwardly so as to produce the greatest volume of useful light on the working plane; the inner reflecting surface causes a large volume of the light reflected from the translucent shield to be projected downwardly through the glass without passing through the lamp bulb. The entire upper reflector is of heavy drawn steel, the entire surface of which is porcelain-enameled. The enamel is fused on at a temperature of 1,800 degrees Fahrenheit, producing a glass-like surface impervious to heat and moisture. This is therefore an ideal unit for use with nitrogen-filled lamps.

A well ventilated cap fastens the translucent shade to the collapsible tripod holder, making a neat, safe and efficient form of attachment. Owing to the correct design of the upper reflecting surface, the cap supporting the translucent shade does not cast a shadow below the unit. The unit can be attached to the stud of any standard outlet box. Should it be desired to attach the unit to a fixture stem or chain, a knockout is provided, which can be readily removed.

The Underwriters' Laboratories have passed on the unit and it bears their label. The unit is made in three sizes, 16, 20, and 24 inches in diameter.

## "Kwik-Lite" Electric Lantern.

A new electric lantern, which uses a common round No. 6 dry cell, has been

Kwik-Lite Electric Lantern.

especially designed to meet the needs of those who wish a reliable, serviceable, low-priced lantern. It is strongly made of pressed steel with black rubber finish and has a convenient bail for carrying in the hand or it may be slipped over the arm, thus leaving both hands free to use. It is equipped with a scientifically designed reflector, which projects a clear penetrating spot light a long distance. This lantern is fitted with a powerful Mazda bulb, and convenient positive contact. It has no wire connections or adjustments of any kind.

This new device is known as the "Kwik-Lite" lantern, and is being marketed by the Usona Manufacturing Company, Incorporated, 1 Hudson Street, New York City, and 309 South St. Clair Street, Toledo, O. This company has also secured exclusive rights to the battery lantern formerly known as the Beers lantern.

## The Largest Frequency-Changer.

The largest frequency-changer of its type in the United States has been installed by the Edison Electric Illuminating Company of Boston in service supplying energy to the Boston Elevated Railway Company. The Edison company uses a frequency of 60 cycles, while that of the railway company is 25 cycles. Hence the necessity of apparatus to make possible the interchange of energy.

The new machine is of 9,000 kilowatts continuous capacity, with a two-hour capacity of 10,500 kilowatts. It consists of two alternating-current generators with shafts coupled together and designed to be run, one as a motor to drive the other. The rated speed is 300 revolutions per minute, and the 60-cycle machine has 24 poles while the 25-cycle machine has 10 poles. The whole unit weighs 105 tons, the revolving part weighing 62 tons. The machine rests on four bearings and is of so great weight as to force all oil out of the bearings. This is provided against by a pump which forces oil under the shaft to float it while starting, after which it is self-lubricated.

The machine has been tested by running six hours with a load of about 10,000 kilowatts. For the first three hours the Elevated Company supplied energy to it and then the conditions were reversed and current was supplied back by the Edison Company. The systems ran well in parallel, the machine coming up to the guarantees. The apparatus was furnished by the General Electric Company.

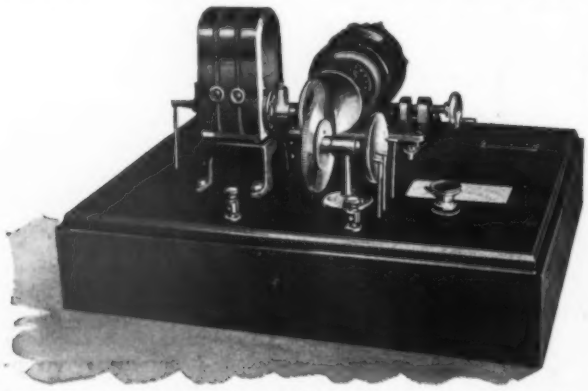
## Electrical Equipment for Sugar Mill.

The Manati Sugar Company, whose plant is in the province of Oriente, Cuba, and main office in New York City, has recently placed an order with the Westinghouse Electric & Manufacturing Company for electric motors to drive all of its machinery in its new mill with the exception of the engine-driven rolls. This order covers a total of 32 alternating-current motors, having a total capacity of 1,042 horsepower. All of the auxiliaries in this next extension of the Manati Sugar Company's mill will be motor-driven, these auxiliaries including cane and bagasse conveyors, centrifugal pumps, crystalizers, agitators, etc. All of the new material will be in operation for the 1915-1916 grinding.

## Compact Electrotherapeutic Outfit for Physicians, Hospitals and Sanitariums.

The accompanying illustration shows a novel device for the use of electricity as a therapeutic agent. It consists essentially of a magneto, which generates a sinusoidal alternating current, driven by a small motor.

A decided advantage is claimed by the manufacturer of this machine over the older types which generate a uni-directional faradic current. In the alternating-current machine the current rises from zero to maximum, then drops to zero again and alternates, while the faradic current has a break which occurs at the maximum voltage. On this account the faradic current is painful to the patient being treated while the break in the sinusoidal current being at the zero point, is said to be practically painless. The faradic current, being uni-directional, also produces chemical changes in the body while the alternating sinusoidal current, it is claimed, does not.



Electrotherapeutic Generating Set for Physicians and Hospitals.

The beneficial effect of the electric application is obtained through the exercise of the muscles treated. The electrodes are placed at the desired points on the body and the current is turned on gradually by means of a rheostat. As the voltage rises the muscles of the patient contract until maximum voltage is reached. As the voltage decreases the muscles relax. In this way a patient who is too weak to take any of the ordinary forms of exercise can be exercised without effort on his part. Exercise can also be given the involuntary muscles.

The outfits are used in hospitals and sanitariums for the treatment of neuasthenia, weakness of the abdominal muscles, locomotor ataxia, etc.

The magneto is driven by a motor made by the Robbins & Myers Company, Springfield, O. The equipment is manufactured and sold by the Sanitarium Equipment Company, Battle Creek, Mich.

## Electric Lamp for Radiotherapy.

A new type of therapeutic appliance in the form of a conveniently arranged electric lamp with powerful reflector has been placed on the market by the X-Radio Thermo Lamp Company, 1328 Broadway, New York City. This lamp, which is known as the X-Radio Thermo Lamp, is based on the principle that, like the curative and germicidal power of the sun, artifically generated radiant light and heat is very effective in many cases for relieving pain quickly and effectively. It has been found that radiant energy applied by means of an electric lamp is more penetrating in its healing effects than the local application of a hot-water bottle, poultice, or other thermal device. Instead of affecting the surface of the skin and the immediate layers beneath it only, it is claimed by specialists who have made a study of the subject of light and heat therapy, that this method is much superior, being able to reach the actual sources of pain in deep-seated tissues and organs that are not ordinarily affected by surface application of heat.

The device is conveniently arranged for use in relieving local pains from neuralgia, croup and bronchial colds, pains in the back from lumbago, rheumatism and similar difficulties, neuritis, etc. The lamp throws the radiant energy in concentrated form directly upon the portion of the body involved, so that it passes through the skin and penetrates to the tissues or organs affected, thus relieving congestion and restoring the natural functions to the organs. Proper use of the device is easily acquired so that it can be employed with comfort and without danger of burning the skin.

The outfit consists of a silvered parabolic reflector and hood. This is of very high reflecting efficiency and concentrates the light and heat developed by the lamp upon that part of the body involved. A concentrated-filament lamp is used which permits reflection of the light in the most perfect manner. A fiber handle is securely clamped about the socket and reflector holder. A nine-foot connecting cord and attachment plug permits connecting the outfit to any lighting fixture. The outfit is light in weight and easily handled.

When the device is to be used to throw the light and heat upon the face for cases of neuralgia or eye-ache a blue screen, which can be specially provided for the purpose, is used over the end of the reflector. This has a specially prepared blue glass which tones down the brilliance of the lamp, so that its glare does not injure the eye, but does not cut out the actinic rays.

Radiotherapeutic Electric Lamp With Auxiliary Blue Screen.

## Collective Electrical and Mechanical Exhibit at San Francisco.

One of the most interesting exhibits at the Panama-Pacific International Exposition at San Francisco, Cal., is that organized by W. J. Marland, electrical and mechanical engineer, who has a collective exhibit of electrical and mechanical appliances, in Block 21, of the Palace of Machinery, where he is giving a practical operating demonstration of the uses and advantages of appliances manufactured by the 30 firms that he represents. This collective exhibit is proving of interest both to the engineer and layman, and even to the ladies. The principal firms represented and their exhibits are as follows:

Aladdin Lamp Corporation, New York City, therapeutic lamp.

Central Telephone & Electric Company, St. Louis, Mo., portable electric lanterns.

Economy Fuse & Manufacturing Company, Chicago, Ill., full line of Economy renewable cartridge fuses.

Edison Storage Battery Company, Orange, N. J., Edison vehicle storage batteries, train-lighting batteries, railway signal system operating by storage batteries, and the Edison rectifier.

Gold Car Heating & Lighting Company, New York, N. Y., full line of street railway and tramway electric heaters, Gold couplers, ventilators and railway supplies.

Hanovia Chemical Company, Newark, N. J., the Kromayer and Alpine Lamp for electrotherapeutic application.

Home Washing Machine Company, Incorporated, Brooklyn, N. Y., the Walton washer, an electric washing machine that will fit any tub.

Innovation Electric Company, New York City, Liberty and Magic carpet-cleaning machines.

F. D. Lambie, New York City, interchangeable steel molds for the construction of concrete buildings.

Merrit & Company, Camden, N. J., steel furniture, shelving, lockers and cases.

Merrit Hydraulic Company, Philadelphia, Pa., scientific sewerage pumping, sewerage disposal and sewer flushing.

Mirror Advertising Company, San Francisco, Cal., mirror advertising specialty.

Moran Flexible Joint Company, Louisville, Ky., Moran flexible steam and water joints and automatic barrel filler.

Nelson Valve Company, Philadelphia, Pa., iron and steel valves.

Nicholas Power Company, New York, N. Y., motion-picture apparatus, cameragraph, dissolving-view apparatus, inductor, "Little Giant" current saver, motion-picture supplies and accessories.

Pacific Coast Rattan Company, Oakland, Cal., handcraft furniture.

Louis M. Pignolet, New York City, electric measuring instruments, switchboard meters and portable electric meters.

Reed Manufacturing Company, Erie, Pa., full line of Reed tools, all kinds of vises for machine shops, carpenter shops, pipe-cutting tools of every description.

Safety Car Heating & Lighting Company, New York City, a complete car-lighting system, Pintsch gas and electric lighting, and Pintsch gas buoys for marine purposes.

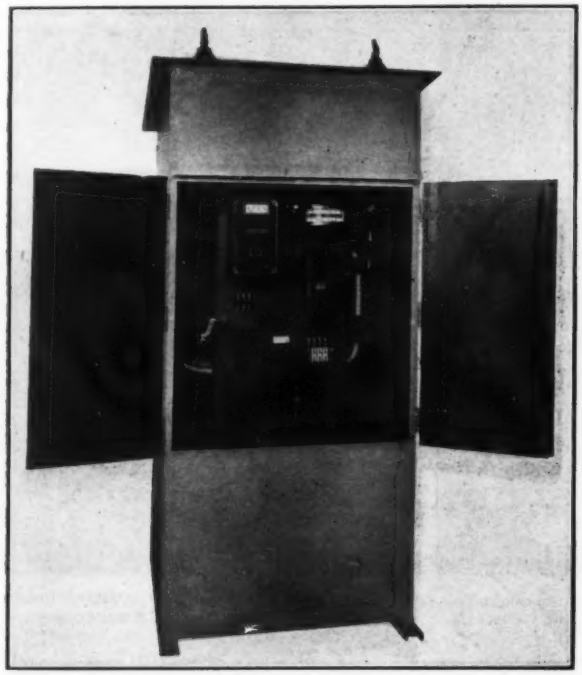
Shelton Electric Company, New York City, electric vibrators.

W. E. Slaughter Company, Incorporated, Chicago, Ill., Parisian electric combs, hair dryers, electric curling iron, and electric waver.

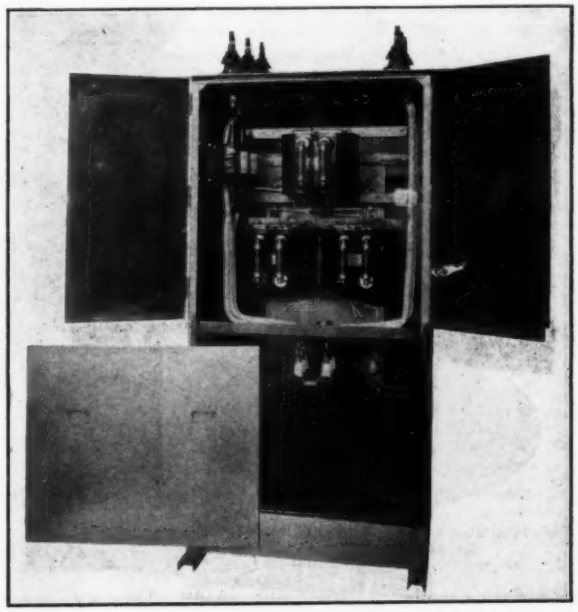
Standard Electric Incubator Company, New York City, "Lo-Glow" electric incubators, chick runs and electric hovers, where chickens are being hatched daily.

The U. S. Light & Heating Company, Niagara Falls, N. Y., electric automobile starter set.

Yarnall-Waring Company, Philadelphia, Pa., Lea V-notch recording liquid meter, Simplex seatless blow-off valve, Simplex-Caskey hydraulic valve, Richards air-controlling specialties, Simplex pipe-joint clamp.



Front View of Opened Switch House for Outdoor Substation for Railway Signal Service.



Rear View of Same 4,400-Volt, Three-Phase Switch House, Opened to Show Interior.

## Outdoor Substation for Railway Signal Work.

The field of application of the rural substation is constantly broadening as its merits become better recognized. The main features are, of course, mobility, ease of installation and low initial cost as compared with a permanent indoor substation of like capacity to accomplish the same result. These points often exert a weighty influence on the solution of the problem of electricity supply, especially when the probable revenue is somewhat speculative, or the need for power either temporary or seasonal. In other cases the question of cost does not determine the installation itself, but merely its character.

The accompanying illustrations show front and rear views of the first outdoor-type steel switch houses of this class built for railway signal purposes, and are used in this connection by the Southern Railway at Inman, S. C., and Austell, Ga. The outdoor substations, of which the switch houses are a part, effect a considerable saving in outlay as compared with what would have been the cost of a substantial permanent substation to house the equipment. Each house is located at the foot of a pole tower supporting the transmission line, the outdoor power transformers, disconnecting switches, choke coils and lightning arresters.

The equipment of the switch houses is a little more elaborate than usually required for power or lighting purposes. The ordinary house, such as exhibited at the Railway Appliance Association Exhibition last month, has merely an oil switch, or an oil switch and watt-hour meter, with the necessary current and potential transformers. In the house illustrated there are also an extra potential transformer, a voltmeter, a circuit-closing relay, two potential receptacles, and an incande-

scent lamp with bracket. The extra transformer, two potential receptacles and voltmeter, in connection with the other two potential transformers required for the watt-hour meter, allow the voltage to be read on both sides of the oil switch before it is closed. The incandescent lamp gives illumination at night for reading the voltage or for lighting the inside of the house. The circuit-closing relay is used in the usual manner to trip the oil switch in case of overload or short-circuit.

Equipments of this kind are now being built by the General Electric Company. The houses are shipped wired complete, so that the only construction work necessary to put them in commission is to place oil in the oil vessels and connect the incoming and outgoing leads to the roof bushings.

## Efficient Asbestos Lamp Shades and Reflectors.

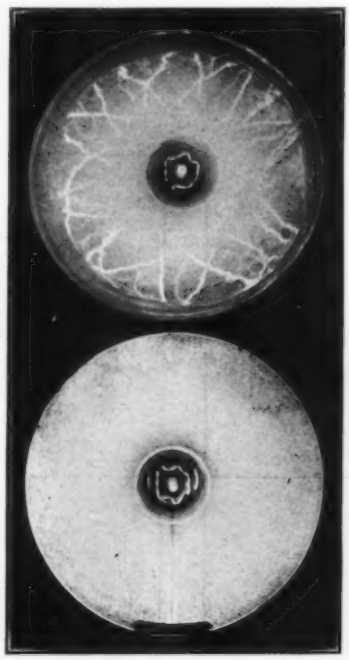
The value of equipping incandescent lamps with reflecting shades in order to direct their light into useful directions and to screen their high brilliancy has become so well known that a multitude of materials and forms are now available. To this aggregation there has been added recently a new reflecting material embodied in a line of shades and reflectors with many unique features.

Asbesto-Gleam Shade With Attached Shade-Holder in Open Position.

These reflectors are made of pure asbestos fiber ground into pulp and rolled into thin boards. This material is shaped into simple conical forms trimmed with brass at the inner and outer edges. The shades and reflectors are made in various sizes and depths; in the smaller sizes with self-contained locking shade-holder of simple but effective design. The inside of the reflector is given a heavy coating of pure aluminum deposited thereon by a special process, then hardened and burnished to insure permanency and high reflecting efficiency. The outside of the shade receives a waterproof enamel-like green finish.

These reflectors are thus provided with a diffusely reflecting surface, which minimizes the glare on polished working planes from the specular reflection of ordinary reflectors. The contrast between the diffuse reflection of the new reflectors and the specular or mirror-like reflection of another type of reflector is well shown in one of the accompanying illustrations. This also eliminates the streaky reflection of lamp filaments.

Among other advantages pointed out by the manufacturer are the light weight of these shades and the ease with which they may be nested for shipment or storage on shelves. They are also not breakable like glass or porcelain shades, not combustible like cardboard, and do not flake, crack or dent if dropped or roughly handled.



Views Looking Into Porcelain-Enameled and Asbesto-Gleam Reflectors.

They are also inexpensive in first cost compared with glass or porcelain and require little maintenance cost. They can withstand heat or moisture without deterioration.

The shades are made for mounting directly on five-eighth-inch standard pipe, directly on brass-shell lamp sockets, and for use with 2.25-inch or 3.25-inch shade-holders. For direct mounting they are provided with a simple and screwless shrinking grip which, by means of a 180-degree thumb twist, clamps the shade instantly and securely to the socket or pipe. By pressing down on a point of the gripping device to force it partly over the socket head, the device is rigidly locked against tampering or removal. The shade cannot tip from proper position or become loosened. Tests of the shades have shown them to have an efficiency superior to similar coated-tin shades.

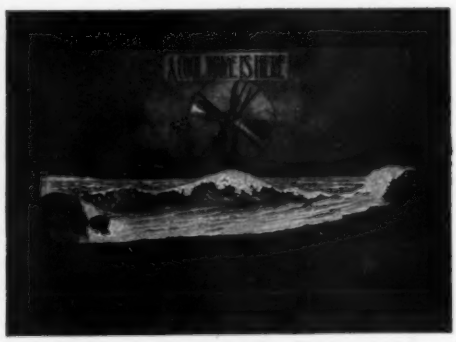
Patents on features of the new shades and reflectors, which are known by the trade name Asbesto-Gleam, have been applied for. These devices are approved by the Underwriters' Laboratories. They are manufactured by the Asbesto-Gleam Manufacturing Company, 846 to 850 South Canal Street, Chicago, Ill.

## Western Electric Prize Fan Window-Display Contest Arouses Dealers' Interest.

Electrical dealers are manifesting great interest in the prize fan window contest, which is being conducted by the Western Electric Company and some particulars of which were published in our issue of January 23, 1915.

For the past three years the company has been actively helping dealers utilize their window space, and the enthusiasm and skill of many dealers who already have entered this contest show that these efforts have not been entirely wasted.

One dealer is preparing a miniature Atlantic City board-walk to run along the front of the window, upon which will move an endless belt carrying miniature dolls, roller chairs, settees, etc. Another enterprising dealer is rigging up a lighthouse on the rocks, using a winking socket to give the resemblance of a flashing light. Still another has made an endless-belt arrangement to which he intends to attach small life boats that will go bouncing along back of the wave cutout.



Background Furnished in Western Electric Fan-Window-Display Prize Contest.

The window-display outfit shown herewith, which the Western Electric Company furnishes free, lends itself admirably to any of these and many other schemes and there is no doubt that when the contest closes on September 1 and the awards are made, which are to be based on their probable ability to attract genuine interest to electric fans, the six prize-winning windows will reveal other and more attractive displays.

## Compact and Light-Weight Motor for Dentists' Use.

Much progress has been made by dentists in the application of electricity to their work. The old dental engine was some time ago electrified by mounting a motor on an adjustable bracket and connecting it to the hand tool by a flexible shaft, the motor being controlled by a floor controller operated by foot. A radical improvement on this type of drive has now been made possible by the recent development of an exceedingly compact and light-weight motor that can easily be held in the hand and needs merely connection through a flexible cord to any convenient lighting outlet.

Fig. 1.—Small Direct-Driving Dental Motor, Exact Size.

This motor is shown full size in Fig. 1. It is said to be the smallest electric motor ever made for regular commercial use. Its weight is only 5.25 ounces. The diameter is 1.25 inches and the length 1.75 inches. The motor takes only 12 watts to operate it at its normal speed of 15,000 revolutions per minute, and it can be run on either alternating current or direct current. Through the use of ball bearings and by careful design the efficiency is made high in view of the compact construction. Bakelite is used as insulation for the windings of the motor, which is entirely inclosed in a thin steel casing.

By means of an ingenious speed reduction of one-fourth between the armature speed and that of the drive shaft the motor drives directly any standard dental chuck, the outfit being used as shown in Fig. 2. A control switch that can be conveniently operated by the hand is mounted on the motor. It has three positions, of which the middle one is for stopping and the two extreme positions are for starting in opposite directions. Motor-speed control can be effected by means of a foot-operated floor rheostat for the regular set or by means of a compact rheostat secured to the cord for the completely portable set.

A marked advantage of this little motor, which makes it peculiarly valuable for the dentist, is its unobtrusiveness in decided contrast to the formidable-looking dental engine that frightens the nervous patient and creates the fear of painful grinding and drilling. The outfit is also easily operated, even a student being able to manipulate it with good results. Besides these advantages, it is efficient and very convenient.

Although developed primarily for dental use, this motor can also be used to great advantage wherever it is desired to secure direct drive of any light tool or instrument by a self-contained hand-held and controlled device. It is believed that it may find valuable application in surgery and allied professions, in lithography and engraving, etc. This motor has been developed and placed on the market by the Shelton Electric Company, 32 East Forty-second street, New York City.

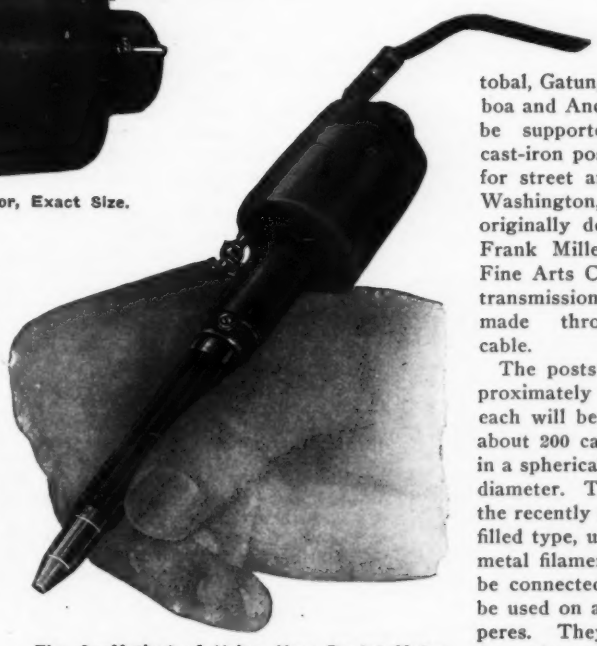


Fig. 2.—Method of Using New Dental Motor.

## Stainless Steel.

A firm in Sheffield, England (Thomas Firth and Sons, Limited) has introduced "Firth's stainless" steel, which it claims is nonrusting, unstainable, and untarnishable. This steel is especially adapted for table cutlery, as the original polish is maintained after use, even when brought in contact with the most acid foods, and it only requires ordinary washing to cleanse. It is claimed that it retains a keen edge much like that of the best double-shear steel and, as the properties claimed are inherent in the steel and are not due to any treatment, knives can readily be sharpened on a "steel" or by using the ordinary cleaning machine or knifeboard. It is expected it will prove a great boon, especially to large users of cutlery, such as hotels, steamships, and restaurants.

The price of this steel is about 26 cents per pound for ordinary sizes, which is about double the price of the usual steel for the same purpose. It also costs more to work up, so that the initial cost of articles made from this new discovery, it is estimated, will be about double the present cost, but it is considered that the saving of labor will more than cover the total cost in the first twelve months.

An American branch of the firm (Firth Sterling Steel Company, McKeesport, Pa.) is manufacturing the new steel in this country.

## Street-Lighting System for Panama Canal Zone Towns.

Permanent street-lighting systems are to be installed in the permanent towns of the Canal Zone, namely, Cristobal, Gatun, Pedro Miguel, Balboa and Ancon. The lights will be supported on ornamental cast-iron posts of the type used for street and park lighting in Washington, D. C., which were originally designed by the late Frank Millett, member of the Fine Arts Commission, and the transmission of current will be made through underground cable.

The posts will be spaced approximately 175 feet apart, and each will bear a single lamp of about 200 candlepower, inclosed in a spherical globe, 14 inches in diameter. The lamps will be of the recently developed nitrogen-filled type, using a concentrated metal filament. The lamps will be connected in series and will be used on a current of 6.6 amperes. They will be supplied from the nearest substations of the trans-Isthmian transmission system through constant-current transformers and the usual switchboard control apparatus; there will be one circuit each at Cristobal, Gatun, and Pedro Miguel, and four separate circuits for the Ancon-Balboa district. The underground transmission will be made through a lead-sheathed, band-steel-armored cable of No. 6 B. & S. copper.

The necessary material for these systems has already been ordered from the United States. The requisition calls for an aggregate of 600 posts, 120,000 feet of armored cable, and 31,000 feet of unarmored cable, which, with the miscellaneous materials, lamps, shades, etc., will cost approximately $46,000. This amount does not include two ornamental posts for the front of the administration building.

# Latest Approved Fittings

**The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.**

**CABINETS.—Federal Electric Company,** Lake and Desplaines Streets, Chicago, Ill.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Approved March 19, 1915.

**CABINETS.—Sterling Switchboard Company,** 537 South Seventh Street, Camden, N. J.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached.

Approved February 4, 1915.

**CONDUIT BOXES, Supports for.—Economy Electrical Specialty Company,** 417 South Dearborn Street, Chicago, Ill.

"D" or "BAR" supports for conduit boxes.

Supports consist of formed strap-iron bars and malleable hickeys. Bars have numerous perforations for convenience in fastening them on joists, etc. Boxes are secured on hickeys between bars and locknuts that thread on hickeys. Designed for mounting conduit boxes in hollow walls and ceilings.

Approved February 26, 1915.

**CONDUIT OUTLET PLATES.—J. T. Meleady,** 63 North Thirteenth Street, Newark, N. J.

J. T. M. outlet plates for combination gas and electric and straight electric outlets, for use in knob-and-tube work.

Standard for use only with quarter-inch flexible tubing.

Approved February 27, 1915.

**FASTENER.—Thomas E. Hopson,** 213 Wellington Street, Ottawa, Ont.

Flexible Tubing Fastener. For use in securing flexible tubing at outlets.

Approved March 11, 1915.

**FIXTURES. — Benjamin Electric Manufacturing Company,** 120 South Sangamon Street, Chicago, Ill.

Show-case or window reflector consisting of metal troughs, special double-ended receptacles for tubular lamps, and terminal connecting blocks permanently wired with No. 14 B. & S. gauge slow-burning wire, inclosed in flanged sides of reflector. Catalog No. 4290.

Approved March 15, 1915.

**FIXTURES.—F. A. Hardy and Company,** 10 South Wabash Avenue, Chicago, Ill.

Adjustable wall-bracket with standard socket, wired with standard portable reinforced cord terminating in a standard separable attachment plug.

Approved February 16, 1915.

**FUSES, Cartridge Inclosed.—Bussman Manufacturing Company,** 1121 Newhouse Avenue, St. Louis, Mo.

Buss cartridge inclosed fuses.

Ferrule type, 0-60 amperes, 250 volts.

Knife-blade type, 61-200 amperes, 250 volts.

Approved February 26, 1915.

**FUSES, Cartridge Inclosed.—Multi-Refillable Fuse Company,** 723 Fulton Street, Chicago, Ill.

Ferrule-type refillable fuses consisting of fiber shells; metal end caps; powder filler; fusible elements of zinc wire soldered to terminals in form of screws and stranded copper wire.

0-60 amperes, 250 volts.

While laboratory tests indicate that these fuses as originally supplied by the manufacturer are satisfactory in rating and in short-circuit operation, similar tests also indicate that, when refilled by the user under ordinary conditions, the omission of all or a portion of the filler, or variations in the manner of assembling, may result in unreliable performance and may render the fuses hazardous.

Present rules and requirements of the National Electrical Code do not permit the use of cartridge-inclosed fuses with readily renewable elements. The general question of the use of such devices has been referred to the Electrical Committee of the National Fire Protection Association.

Approved February 15, 1915.

**INCUBATORS AND BROODERS, Electrically Heated.—Chicago Surgical and Electrical Company,** 859 North Franklin Street, Chicago, Ill.

This surgical incubator consists of an asbestos-lined case provided with a glass door, two candelabra lamp receptacles, a thermostat and a thermometer. A portable cord is provided for attachment to supply circuit.

Approved February 16, 1915.

**PICTURE MACHINES AND APPLIANCES.—Enterprise Optical Manufacturing Company,** 564 West Randolph Street, Chicago, Ill.

Motion-picture projector.

Motiograph for hand operation, catalog No. 1004-A.

For motor operation, equipped with complete film inclosure from magazine to magazine, automatic shutter, spring-hinged magazines, inclosed motor and automatic shield operated by opening of film gate, and provided with special motor supplied by Enterprise Optical Manufacturing Company. "Motiograph" catalog No. 1004-C.

Approved February 27, 1915.

**POPCORN AND PEANUT MACHINE.—C. Cretors and Company,** Twenty-second and Jefferson Streets, Chicago, Ill.

Cretors corn poppers and peanut roasters. These devices consist of combinations of motor-driven corn poppers and peanut-roasting drums and steam tables, the burners of which are designed for use with illuminating gas. Sockets for incandescent lamps for illumination or display signs are provided. Models "DeLuxe" 400, 450 and 550.

Approved March 6, 1915.

**RECEPTACLES, For Attachment Plugs.—The Bryant Electric Company,** Bridgeport, Conn.

Bryant or Perkins.

Flush Type. Junior, 6 amperes, 250 volts, 12 amperes, 125 volts, catalog No. 508 (with plate).

Disappearing door type, 10 amperes, 250 volts, with "Condulet," catalog Nos. 497, 498.

Approved March 10, 1915.

**SIGNAL APPLIANCES.—The Holtzer-Cabot Electric Company,** Brookline, Mass.

Bells, "H-C," 6-220 volts, alternating and direct current.

Type S.

Water-tight type.

Double-gong type.

Horns, "H-C," 6-220 volts, alternating and direct current.

Approved March 6, 1915.

**SOCKETS, Weatherproof.—Pass and Seymour, Incorporated,** Solvay, N. Y.

Porcelain shell, 1,500 watts, 600 volts, catalog Nos. 517-19 inclusive, 534-36 inclusive.

Approved February 27, 1915.

**SWITCHES, Combination Cutout.—The Trumbull Electric Manufacturing Company,** Plainville, Conn.

Panel cutouts with snap switches, 10 amperes, 125 volts, with metal or porcelain covers, catalog Nos. 394-397 inclusive, 495-498 inclusive.

Approved March 1, 1915.

**THEATER APPLIANCES. — Universal Electric Stage Lighting Company** (Kliegl Brothers, proprietors), 240 West Fiftieth Street, New York, N. Y.

Kliegl stage cable connectors, consisting of two and three-wire pin plugs and receptacles with current-carrying parts mounted in fiber blocks.

Two-wire, 125 volts, catalog Nos. 950, 951, 955, 956, 957, 958, 960, 990, 2950, 2951 and 2955.

Three-wire, 125-250 volts, catalog Nos. 3950, 3951, 3955, 3956 and 3957.

Approved February 27, 1915.

# Current Electrical News

## ATLANTIC STATES.

EASTHAMPTON, MASS. — The town engineer has prepared an estimate of the cost of lighting the streets and public buildings by a municipal plant. The town now expends about $7,600 annually for these purposes, and operates a pumping station by steam power. The proposal was to combine the two plants. A proposition has been received from the local central station, offering to take over the pumping station for 10 years and furnish electric power for pumping at eight mills per kilowatt-hour. This proposition is held to be much more advantageous than the construction of a municipal plant.

HARTFORD, CONN.—The Northern Connecticut Light and Power Company, with a capital of $500,000 and $350,000 of bonds, has petitioned the legislature for the right to increase its capital to $1,000,000. This company supplies gas and electricity to the Hartford suburban towns of Windsor, Windsor Locks, Suffield, Thompsonville and Hazardville. It buys gas from the Hartford City Gas Light Company and now has plans for the construction of a gas plant of its own.

NORWICH, CONN.—The Rex Power Company has applied for a charter allowing it to generate, buy, sell and furnish electrical energy in New London and Windham counties. Initial capital stock is $50,000, to be increased to $500,000 as needed. The incorporators are C. R. Alexander, James J. Donohue and C. E. Chapman.

ALLENTOWN, PA.—A fund of $120,000 is now being raised for the purpose of providing the local Y. M. C. A. with a new building. Work is expected to start during the coming summer, the electrical contracts to be awarded shortly thereafter. Frank M. Trexler is chairman of the Board of Trustees and H. W. Elvidge is secretary.

ALLENTOWN, PA.—The Lehigh Valley Light and Power Company will shortly extend its field of operation to the north of this city, having contracted with a sufficient number of prospective customers in the towns of Schnecksville and Neffs, about 12 miles distant, to warrant service at these points. The high-tension lines feeding the slate regions will be tapped through an outdoor substation midway between these two communities. A. H. S. Cantlin is general manager.

ALLENTOWN, PA.—The Allentown & Reading Traction Company, operating a line between this city and Reading, has abandoned the power plant at Griesemersville, near here and in the future will be supplied from the lines of the Lehigh Valley Light and Power Company. The generating plant at Kutztown will be continued in operation to supply power in the district between that town and Reading. Dorney Park, which is owned by the same company, will also be supplied with alternating-current lighting circuits during the summer season.

AMBRIDGE, PA.—The Standard Seamless Tube Company factory here is being wired for lighting and power service. Energy will be supplied from Pittsburgh over a special power line to be constructed. Rights of way for the pole line are being secured through farms of Harmony and Economy townships. Statutory rights on the part of the state is being recognized by the Philadelphia Company to the lands in Harmony township, and in addition to securing the right of way from the present holders of the property, concurrent privileges are also being obtained from the informants in escheat.

HANOVER, PA.—At a special election held here recently the borough school board was authorized to erect an $85,000 high school building. A modern electrical installation will be one of the features of the new edifice.

LEHIGHTON, PA.—The school board has determined to increase the indebtedness of the district by $100,000 for the purpose of erecting a new school building here. The electrical installation will be modeled along the most approved lines.

HUNTINGTON, W. VA.—The Virginian Power and Electric Company, of Charleston, is reported to be interested in a plan for the construction of a line of electric railway from this place to St. Albans, where it will connect with the Charleston Interurban Railway Company.

WILLIAMSON, W. VA.—The Williamson Light and Ice Company will rebuild the electric and ice plant which was recently destroyed by fire. It will install 200 and 400-kilowatt, 2,200-volt generators, and other equipment.

CARY, N. C.—The city will issue bonds not to exceed $20,000, to install and equip an electirc light plant. Address J. M. Templeton, mayor.

ST. PETERSBURG, FLA.—Four petitions to the Board of City Commissioners, asking for an election to vote on an issue of $150,000 for the erecting of a municipal electric light and power plant, have been placed in circulation.

## NORTH CENTRAL STATES.

HAMILTON, O.—Work has begun upon the warehouse, cold storage plant, offices and other buildings to be constructed by C. A. Ervin & Company for the Wiedemann Brewing Company here, contracts having jus been signed. A considerable amount of electrical work is involved. L.

SPRINGFIELD, O.—A basis has been worked out by the city commission by which cluster lighting will be installed on an assessment of $1.05 per front foot against all property in the district lighted. The use of gas, instead of electricity, is now proposed.

BLOOMINGTON, ILL.—The commissioners of the Spring Lake drainage district petitioned the court for an additional assessment of $18,000, with which to install electric power at the pumping station in the district, and to make other improvements in the district. Address H. A. Bell, county surveyor.

GIBSON CITY, ILL.—Business men here are planning the installation of an ornamental lighting system along three blocks of the business section. The Commercial Club is back of the movement. J. H. White is treasurer of the club.

HILLSBORO, ILL.—The Southern Illinois Light and Power Company, J. J. Frey, president, is securing the right of way and expects to build a transmission line 11 miles in length, and another 20 miles in length, which will cost about $2,000 per mile, during the coming summer.

DOWAGIAC, MICH.—Following an election in which the voters declared in favor of electric light and gas plants, officials are negotiating with the managers of the Beckwith Electric Light Company and the Dowagiac Gas and Fuel Company for the purchase of their properties.

FRIENDSHIP, WIS.—The Friendship Light and Power Company, of which George Polivka is president, is contemplating the purchase, among other things, of 32 meters, 300 incandescent lamps, 3 transformers, six pairs of lightning arresters, a generator, a number of washing machines and flatirons and a quantity of wire. X.

HUSTIFORD, WIS.—Plans for the construction within the next few months of from four to five miles of transmission line are being considered by the Hustiford Light, Power and Manufacturing Company. Later the company will purchase a number of transformers and a voltage regulator.

LOMIRA, WIS.—The Lomira Light and Power Company will purchase within six months, several washing machines, flatirons, some wiring supplies and ten meters. X.

SUPERIOR, WIS.—Fire Chief Olaf Johnson, in his annual report, filed with the city commissioners March 22, recommends the installation of an underground fire-alarm system. X.

MANKATO, MINN.—Bids for about $2,500 worth of equipment, to be used in providing this city with a white way will be advertised for in the near future. Four 1,000-candlepower lamps to the block will be used in part of the system, and two 1,000-candlepower lamps to the block in the rest. Separate bids will be asked on nitrogen-filled lamps and on luminous arcs, and

also on posts. The bids will be opened about April 12. X.

ST. PAUL, MINN.—Earle D. Jackson, consulting engineer of this city, has on file in his office specifications for the construction of a complete electric lighting system for the town of Larchwood, Iowa. The work is divided into three parts: (1) A cement block building. (2) The furnishing and erecting of an oil engine, generator, storage battery and switchboard. (3) Electrical distribution system. Bids will be received on complete parts only, and must be accompanied by certified check to the amount of five per cent of the contract price. Bids will be received by W. F. Ashton, town clerk, Larchwood, until April 21, 1915.

DONNYBROOK, N. D.—It is announced that the stock company plan for the development of an electric lighting system has been dropped, and that W. S. McIntire will build a plant to furnish the village with light and power.

FORBES, N. D.—A franchise has been granted to Hixson & Leet for the building of an electric plant and distributing lines.

RAYMOND, S. D.—The town is considering the proposition of putting in an electric light plant. It is understood that pledges have been made by the citizens to subscribe for between 400 and 500 lamps at the present time.

CHAPMAN, KANS.—The city council has issued a proclamation to vote a bond issue of $10,000 at the regular spring election, for the erection of a municipal light plant. A private plant is now operating on a 12-hour basis. This probably will be bought by the city and 24-hour service installed.

LEIGH, NEB.—Ways and means are under consideration for establishing a $10,000 electric light system. Address town clerk.

SYRACUSE, NEB.—One of the important matters that will be submitted for vote at the spring election will be the question of raising funds for the installation of an electric lighting system. The Commercial Club is behind the movement to secure electrical illumination.

SPRINGFIELD, MO.—The Heer-Andres Investment Company, owners and builders of the new Heer Dry Goods Company building, will erect a three-story fireproof building to house the lighting plant which is to supply current to the dry goods store. Cost of building and plant will be $25,000 to $30,000, of which $18,000 approximately will cover electrical equipment. Two large generators will be installed. Plans are being drawn by Architect A. N. Torbitt. M.

SPRINGFIELD, MO.—R. L. Pate, manager of the Springfield Water Company, together with other officials, is negotiating the purchase of $30,000 of electrical pumping machinery.

## SOUTH CENTRAL STATES.

DIXON, KY.—A committee of citizens was appointed at a mass meeting to look into projects for electric lights for Dixon and the meeting heard reports of successful ventures in other towns of the size of Dixon. The Clay (Ky.) Company has proposed to build a line from Clay and give service, while Melton & Melton, mill owners here, are figuring on another project to be presented to the city. B. W. Mauzy, R. L. Jackson and R. M. Baker compose the citizens' committee.

LOUISVILLE, KY.—The Harry I. Wood Company has just completed installation of the electric equipment in the new plant of the W. T. Pyne Mill & Supply Company, at Logan and Rupp Streets. The motors for this plant ranging from three to 25 horsepower and numbering nearly a score, were supplied by the James Clark, Jr., Electric Company, of Louisville, and most of them are in operation.

PADUCAH, KY.—An appropriation of between $17,000 and $25,000 would be necessary before a "white way" system could be installed on the principal streets of the city, according to L. A. Washington, Commissioner of Public Works.

DRESDEN, TENN.—The city will install an electric light plant to cost about $10,000, and to include a power house. The city is now receiving machinery bids. Address R. L. Suddath, mayor.

BRYAN, TEX.—The municipal electric lighting system is to be extended. W. W. Harris is mayor. D.

FLORESVILLE, TEX.—B. J. Carrico, of Fort Worth, and associates, who were recently granted a franchise for installing an electric light and power plant here, have organized the Floresville Light and Power Company. The new plant will cost about $13,000. D.

MONTAGUE, TEX.—A company headed by W. A. Parker, of Dallas, is being organized for the purpose of constructing an electric light plant here.

PALESTINE, TEX.—The Texas Power and Light Company has adopted plans for a new electric light and power plant, which it will erect here at a cost of $83,000. D.

PALESTINE, TEX.—The International & Great Northern Railroad Company will equip its general shops and division terminals here with electric power and lights. It will expend about $25,000 in the purchase of necessary equipment. D.

VICTORIA, TEX.—It is planned by the city council to build a municipal electric light plant here to cost about $40,000. D.

## WESTERN STATES.

DEER LODGE, MONT.—The city council will shortly receive bids, it is reported, for extending the cluster lighting system into the residence district, same to be installed by June 1. The approximate cost of the construction is estimated at $1.15 per foot for each lot embraced within the district, totaling about $6,000. The proposed installation will be a three-light affair, two of which can be turned off from the power house. The installation will be made on both sides of Main Street, from Cottonwood Avenue to Montana Street, both sides of Second Street, from Missouri Avenue to Milwaukee Avenue, both sides of Missouri Avenue from First to Fourth; Milwaukee Avenue, from First to Fourth; on the west side of Fourth Street, from Missouri Avenue to Milwaukee Avenue. O.

RENO, NEV.—Plans calling for the expenditure of from $25,000 to $30,000 in providing additions to the Bell Telephone Company of Nevada's systems in Reno and Sparks have been approved by C. F. Price, plant engineer, and L. C. Levy, of the company.

WINNEMUCCA, NEV.—H. G. Christenson, St. Clair Moore and H. R. Lemaire are behind a proposition to erect a power plant to furnish current for light and other purposes in the town of Battle Mountain.

PAROWAH, UTAH.—Articles of incorporation have been filed for the Iron County Electric Light Company, whose purpose is the installation of an electric light plant at this place. No bonds will be issued. T. J. Yates, an engineer of Salt Lake City, assisted by James Ollerton, of this place, has had the matter in hand. U.

WALES, UTAH.—The Big Springs Electric Company, of Fountain Green, has petitioned the town board for a franchise for the installation of an electric light system here. U.

HUNTINGTON, UTAH.—A company has been formed here for the purpose of installing an electric light and power plant. It will do business under the name of the Huntington Electric Light and Telephone Company. The officers are: Mart Jensen, president; L. N. Strong, vice-president; Byron Howard, secretary. The location of the proposed power plant has already been determined, and construction work will start at an early date. U.

NOGALES, ARIZ.—The Nogales Electric Light, Ice and Power Company has recently installed a complete new plant, consisting of 250-horsepower Snow oil engine, and a 187-kilovolt-ampere, 2,200-volt General Electric generator, and has placed an order for a second generator in duplicate. The distribution system has been rebuilt and changed from three-wire, direct-current, to 2,200-220-110-volt, alternating current. The company was granted a franchise at a special election on March 15. It will double the capacity of its present ice plant, and by the time these extensions are completed will have spent between $75,000 and $80,000.

ELLENSBURG, WASH.—A call for bids for the $55,000 improvement to the municipal lighting system has been issued, and a special election will be held to ratify a bond issue. The improvements include a modern fireproof building, to house the light plant, and a new steam auxiliary turbine, capable of carrying the entire load in an emergency.

NORTH YAKIMA, WASH.—Receiver E. F. Benson, of the Hanford Irrigation and Power Company, here, recently sold the properties of this concern, valued at more than $1,000,000, to Henry K. T. Lyons, of Denver, who is said to represent the American Light and Power Company. The purchase price was $386,000. Of this amount $213,733.33 was paid in cash, and the balance in bonds of the irrigation company at face value and accrued interest. The water-power site of the Hanford Company on the Columbia River at Priests Rapids is said to be the greatest asset of the company. During the past two years valuable lands near the site of the Hanford Company, at Priests Rapids, have been purchased by capitalists, said to be working in the interests of the American Light and Power Company. Rumor has it that the recent sale registers another step toward the utilization of this water power on the Columbia River for the electrification of the western end of the Chicago, Milwaukee & St. Paul Railroad,

which is now electrifying one mountain division of its transcontinental line, from Avery, Idaho, to Deer Lodge, Mont., over the Bitter Root Mountain range. The Hanford Company, which was organized by Federal Judge C. H. Hanford, of Seattle, went into the hands of a receiver several years ago.

SEATTLE, WASH.—H. H. Knox, of Cordova, Alaska, holder of a franchise for furnishing light and power in Cordova, recently organized and incorporated the Alaska Electric Consolidated Company. It is reported that capital necessary to install a power plant on Power Creek, seven miles from Cordova, has been secured, and that construction on the improvement will begin early in the summer. The directors of the Alaska Electric Company are all prominent Seattle business men, among whom are the former postmaster of Seattle, George Russell, now secretary of the American Savings and Trust Company; E. L. Terry, city treasurer of Seattle, and DeVillo Lewis, a prominent attorney. O.

TACOMA, WASH.—It is reported that the city council has instructed City Attorney Stiles and Superintendent of Electrical Works Collins to draw up an agreement between the city of Tacoma and the Tacoma Central Heating Company, for the maintenance of an auxiliary steam plant, by the Tacoma Central Heating Company, capable of developing approximately 6,000 horsepower, which will be utilized by the city. In return for the franchise the company will furnish this auxiliary power to the city. Owing to shortage of water power during summer months at the municipal power plant at La Grande, the city has come to the conclusion that an auxiliary power plant is absolutely essential. O.

TACOMA, WASH.— The Puget Sound Electro-Manganese Company, of Tacoma, which recently purchased the properties and smelter of the Pacific Steel & Iron Company, of Tacoma, announces the construction of a 100,000-horsepower station on the Skokomish River, and the installation of 10 additional electric furnaces in their smelter in Tacoma. Also the construction of transmission lines and other electrical construction. It is announced the work will begin this spring, and that ultimately several million dollars will be expended. The company now owns and operates a large smelter in Tacoma, and has mineral claims in the Olympic peninsula, near Port Townsend. O.

TACOMA, WASH.—Attorney Lorenzo Dow has asked the county for a franchise for a pole line along the right of way of the White and Stuck river improvement project by the Mutual Electric Light and Power Company, of Riverside.

TACOMA, WASH.—In a recent statement to the City Council of Tacoma, Engineer Savage said that if the city wanted to continue in the power business, it would either have to construct a steam auxiliary to its present $2,500,000 power plant or construct an entirely new power plant on another site. The council, in turn, instructed Engineer Savage to investigate feasible sites on the Nisqually River, with the end in view of developing the most desirable. The council has determined that if an auxiliary plant is not constructed, a new power plant will have to be built. O.

BEND, ORE.—The Bend Flour Mill Company has been granted a franchise to erect poles in certain streets of the city to bring power for use at its mill near Wall Street.

GOLD HILL, ORE.—City Recorder Harding will receive bids up to April 7 for the installation of a street lighting system and furnishing current for 10 years.

FRESNO, CAL.—The city trustees have authorized the ordinance committee to draw up an ordinance requiring all power, telephone and telegraph wires to be placed underground within a certain period of time.

MARTINEZ, CAL.—Guy Putnam, of Pleasant Hill and Walnut Creek, was here recently interviewing the proper authorities with a view to securing an extension of electric light and power service of the Pacific Gas and Electric Company into several districts not served at present.

## PROPOSALS.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the county commissioners of Dayton, O., until 12:00 o'clock noon on April 14, for all labor and material involved in the construction of the men's dormitory building at the county infirmary, including electrical and other work. Plans and specifications are in the possession of Messrs. Schenck & Williams, Dayton, O.

ELECTRIC LIGHT EQUIPMENT.—Sealed bids will be received April 13 for the furnishing, f. o. b., poles, cross arms, insulators, transformers, ornamental standards, conduit, wire, and necessary material to complete the commercial and residence street lighting and distributing system for commercial purposes; also for the necessary labor for erection and completing of said system. Address W. A. McHenry, city clerk, Nelson, Neb.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received by the Harbor and Subway Commission of the City of Chicago, April 12, at room 2001 City Hall Square Building, 139 North Clark Street, Chicago, for furnishing and installing electrical equipment on Pier No. 2, Harbor District No. 1, according to plans and specifications on file in the office of the Harbor and Subway Commission. Address L. E. C. Shankland, Chairman Harbor and Subway Commission.

INTERCOMMUNICATING TELEPHONE SYSTEM.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until April 21, for the installation of an intercommunicating telephone system for the offices of the United States district attorney in the United States court house and postoffice at New York City, in accordance with the specification, copies of which may be had at the office of the Supervising Chief Engineer in the discretion of the Supervising Architect.

## NEW PUBLICATIONS.

CANADIAN MINERALS.—The Canadian Department of Mines has issued a preliminary report for 1914 on "Mineral Production of Canada," by John McLeish.

FRENCH ELECTRICAL DIRECTORY.—The 1914 edition of "Annuaire de l'Electricité," published by *La Lumière Electrique*, Paris, France, has appeared. It contains lists of lighting and power companies, electric railways, electrical societies, schools, publications, etc., and legislation enacted during 1913. The price is four francs.

## FINANCIAL NOTES.

The Northwestern Electric Company has sold to E. H. Rollins & Sons and other bankers $3,000,000 six-per-cent bonds. While no offering of bonds has yet been made, it is understood that they will be offered around par. The company operates a hydroelectric plant on the Salmon River in Oregon, and supplies current for light and power in Portland in competition with the Portland Railway, Light and Power Company. The company recently offered $2,000,000 preferred stock at 82.25, and it is understood that more than half of this stock has been sold.

At the annual meeting of the Union Gas and Electric Company, of Cincinnati, O., held last week, Charles P. Taft and his nephew, Robert A. Taft, son of the former president, were added to the board of directors, the other directors being re-elected. The report of President W. W. Freeman indicated that gross earnings for the year amounted to $5,632,683.62, of which $3,420,689.34 was from gas, $2,056,110.85 from electricity and the remainder from miscellaneous sources. The net surplus for the year was only $61,596.19, $1,887,883.51 being turned over to the Cincinnati Gas and Electric Company as rental for the operating plant.

### Dividends.

| | Term. | Rate | Payable |
|---|---|---|---|
| Am. Pub. Serv. pf. | Q | 1.75% | April 1 |
| Au., Elgin & Chi. R. R., pf. | Q | 1.5 % | May 1 |
| Bell Tel. of Pa. | Q | 1.5 % | April 15 |
| Cen. & S. Am. Teleg. | Q | 1.5 % | April 8 |
| Cit. Trac. Phila., pf. | Q | 1.5 % | April 12 |
| Dayton Pr. & Lt., pf. | Q | 1.5 % | May 1 |
| Elec'l Securities Corp. | Q | 2 % | April 15 |
| Elec'l Securities Corp., pf. | Q | 1.25% | May 1 |
| Mexican Teleg. | Q | 2.5 % | April 15 |
| Mountain Sts. Tel. & Tel. | Q | 1.75% | May 1 |
| National Carbon | Q | 1.5 % | April 15 |
| New Eng. Pr., pf. | Q | 1.5 % | April 1 |
| Northern Sts. Pr., pf. | Q | 1.75% | April 15 |
| Ottawa Lt., Ht. & Pr., pf. | Q | 1.75% | April 15 |
| Ottumwa Ry. & Lt., pf. | Q | 1.75% | April 15 |
| Southern Cal. Edison, pf. | Q | $1.50 | April 15 |
| So. Carolina Lt., Pr. & Rys. | Q | 1.5 % | April 1 |
| United Rys. & Elec. of Balt. | Q | 1 % | April 1 |
| Va. Ry. & Pr., com. | S-A | 1.5 % | April 20 |
| W. States Gas & Elec., pf. | Q | 1.75% | April 15 |
| Westinghouse Elec. & Mfg., pf. | Q | 1.75% | April 15 |
| Westinghouse Elec. & Mfg., com. | Q | 1 % | April 30 |

### Reports of Earnings.

MONTREAL LIGHT, HEAT & POWER.

Ten months ended February 28, 1915:

| | 1915 | 1914 |
|---|---|---|
| Gross earnings | $5,534,477 | $5,275,366 |
| Net earnings | 3,104,616 | 2,929,788 |
| Surplus after charges | 2,743,560 | 2,573,329 |

GEORGIA RAILWAY & POWER COMPANY.

| | 1915 | 1914 |
|---|---|---|
| February gross | $ 518,512 | $467,252 |
| Net after taxes | 208,766 | 192,413 |
| Two months gross | 1,078,817 | 972,340 |
| Net after taxes | 437,753 | 399,025 |

GREAT WESTERN POWER COMPANY.

| | 1915 | 1914 |
|---|---|---|
| February gross | $225,140 | $212,505 |
| Net income | 169,860 | 150,921 |
| Surplus after charges | 66,427 | 52,400 |
| Balance after guaranteed dividends | 53,927 | 39,900 |

TEXAS POWER & LIGHT.

Texas Power & Light Company reports for year ended December 31, 1914, as follows:

| | 1914 | 1913 |
|---|---|---|
| Gross earnings | $1,605,078 | $1,198,762 |
| Net after taxes | 571,690 | 441,051 |
| Surplus after charges | 337,393 | 230,215 |
| Balance after preferred dividends | 181,084 | 119,965 |

CLEVELAND ELECTRIC ILLUMINATING.
(Central States Electric Corporation.)

| | 1915 | 1914 |
|---|---|---|
| February gross | $ 393,163 | $ 412,904 |
| Net after taxes | 216,595 | 211,046 |
| Sur. after int. pref. divs. and amortization | 181,167 | 173,803 |
| Balance after depreciation | 141,851 | 132,513 |
| 12 months' gross | 4,244,293 | 4,114,335 |
| Net after taxes | 2,012,248 | 1,987,781 |
| Surplus after charges, pfd. div. and amortiz. | 1,588,156 | 1,575,470 |
| Balance after depreciation | 1,163,727 | 1,164,225 |

UNITED LIGHT & RAILWAYS.

Earnings of United Light & Railways and subsidiary companies for year ended Dec. 31, 1914:

| | 1914 | 1913 |
|---|---|---|
| Gross earnings | $6,166,850 | $6,057,285 |
| Operating expenses and taxes | 3,794,534 | 3,673,916 |
| Net earnings | 2,369,425 | 2,283,369 |
| Other income | 13,281 | |
| Total income | 2,382,706 | |

MT. WHITNEY POWER & ELECTRIC.

| | 1915 | 1914 |
|---|---|---|
| February gross | $ 53,768 | $ 49,551 |
| Net after taxes | 35,274 | 25,855 |
| Surplus after charges | 22,549 | 14,455 |
| 12 months' gross | 665,307 | 606,243 |
| Net after taxes | 398,399 | 338,056 |
| Surplus after charges | 253,867 | 219,162 |

STANDARD GAS & ELECTRIC.

Standard Gas & Electric Company reports income from all sources, for the year ended December 31, 1914, as follows:

| | 1914 | 1913 |
|---|---|---|
| Gross receipts | $1,939,898 | $1,539,310 |
| Expenses | 39,610 | 36,506 |
| Balance | $1,900,288 | $1,502,804 |
| Bond and note interest | 746,054 | 751,507 |
| Surplus | $1,154,234 | $ 751,297 |

The full report for 1914, to be issued within a short time, will show the actual balance earned for the preferred stock, after charges for other interest and deductions from surplus.

SOUTHERN CALIFORNIA EDISON.

| | 1915 | 1914 |
|---|---|---|
| February gross | $374,162 | $380,354 |
| Net after taxes | 202,329 | 173,105 |
| Total income | 202,677 | 173,282 |
| Surplus after depreciation | 76,741 | 74,782 |
| Balance after charges | 121,741 | 99,782 |
| Two months gross | 770,527 | 785,111 |
| Net after taxes | 419,450 | 372,367 |
| Total income | 423,542 | 372,800 |
| Balance after charges | 259,820 | 226,119 |
| Surplus after depreciation | 156,120 | 151,119 |

KEYSTONE TELEPHONE.

| February | 1915 | 1914 |
|---|---|---|
| Gross | $108,719 | $107,781 |
| Net | 54,461 | 55,939 |
| Surplus | 28,125 | 29,451 |
| Two months | | |
| Gross | 218,606 | 215,259 |
| Net | 109,400 | 109,138 |
| Surplus | 56,676 | 55,917 |

PORTLAND RAILWAY, LIGHT & POWER.

| | 1915 | 1914 |
|---|---|---|
| January gross | $ 489,713 | $ 582,610 |
| Net after taxes | 228,309 | 305,324 |
| Surplus after charges | 45,948 | 132,032 |
| Twelve months' gross | 6,180,274 | 6,752,754 |
| Net after taxes | 2,932,273 | 3,447,367 |
| Surplus after charges | 750,515 | 1,418,505 |

## PERSONAL MENTION.

PROF. ELIHU THOMSON has presented to the town of Swampscott, Mass., where he resides, the site for a new public library to be given by Andrew Carnegie. The lot presented by Professor Thomson is 75 by 110 feet, and is opposite the town hall.

MR. C. W. BENDER has been appointed general manager of the newly organized Nela Specialty Division, at Nela Park, O., to handle specialties manufactured by the National Lamp Works of the General Electric Company. Regular incandescent lamps will not be handled, except in connection with such specialties. Mr. Bender has been connected with the engineering and sales department of the National Electric Lamp Works for many years, and is one of the most aggressive, successful and popular young men in the organization. He has taken a leading part in co-operating with manufacturers, jobbers and contractors, and has initiated many excellent campaigns for educating both the trade and the public to a better utilization of incandescent lamps. He has also been active in behalf of manufacturers, and his work in connection with the Electric Railway Manufacturers' Association has been marked with great success and satisfaction.

C. W. Bender.

MR. R. A. MacGREGOR has accepted the position of sales manager of the Merchants Heat & Light Company, Indianapolis, Ind., resigning as power sales engineer of H. L. Doherty & Company, of New York. Mr. MacGregor's first connection with the electrical business was in 1900. It was in 1905, when working with the West Penn Company, at Connellsville, Pa., under E. T. Penrose, general superintendent, that he had his first experience in motor sales work. He later on was employed by the C. H. Geist Company in the motor service sales department at Plymouth, Pa. He was subsequently employed at Chicago, Ill., to take charge of the commercial work of the company. He resigned in the fall of 1908 to go with H. L. Doherty & Company, operating the Easton (Pa.) Gas and Electric Company. A year later he left the Doherty Company to manage the commercial department of the light, heat and power company at Connersville, Ind. He returned to H. L. Doherty & Company as sales manager of the Empire District Electric Company, at Joplin, Mo., late in 1911. In this position he was particularly successful, especially with regard to sales of power for large equipments. For the past year he has been working from the New York office of the Doherty Company.

## OBITUARY.

MR. EDWARD D. LOCKLIN, assistant New York district manager of the National District Telegraph Company, died on March 25 at a local hospital in New York. Mr. Locklin was about 30 years old, and is survived by a widow.

MR. HORACE DUTCHER, assistant manager of the exporting department of the H. W. Johns-Manville Company, New York, with which concern he had been connected for many years, died on March 26 at his home in Arlington, N. J. He was 39 years old, and was prominent in Masonic life in Arlington, being past master of Triune Lodge.

MR. URIAH H. WIEAND, one of the pioneers in the electrical field of eastern Pennsylvania, died at Emaus, Pa., on March 21 after a short illness. Mr. Wieand was born in Emaus, in 1853, and after teaching school for a time became superintendent of the Hematite Iron Company. In 1888 he became interested in electricity as a form of light and power, and later formed the Allentown Electric Construction and Supply Company, of Allentown, Pa., of which concern he was the head up to the time of his death. He was also interested in various large enterprises, among which was the promotion of the Emaus-Macungie trolley line, now a part of the Lehigh Valley Transit Company, and the Saucon Street Railway Company. In 1890 it was largely through his efforts that the municipal lighting project at Emaus was carried to a successful conclusion. This plant was afterwards taken over by the Lehigh Valley Light and Power Companv. Mr. Wieand served as Burgess of his native town for two terms, and later as postmaster for 12 years.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

| | Mar. 29 | Mar. 22 |
|---|---|---|
| American Tel. and Tel. (New York) | 122 | 120⅜ |
| Commonwealth Edison (Chicago) | 137 | 137 |
| Edison Electric Illuminating (Boston) | 243½ | 239 |
| Electric Storage Battery common (Philadelphia) | 48½ | 48¾ |
| Electric Storage Battery preferred (Philadelphia) | 48½ | 48¾ |
| General Electric (New York) | 142½ | 139½ |
| Kings County Electric (New York) | 119 | 119 |
| Massachusetts Electric common (Boston) | 7 | 7 |
| Massachusetts Electric preferred (Boston) | 30 | 46 |
| National Carbon common (Chicago) | 133 | 133 |
| National Carbon preferred (Chicago) | 120 | 119½ |
| New England Telephone (Boston) | 132 | — |
| Philadelphia Electric (Philadelphia) | 24 | 24 |
| Postal Telegraph and Cables common (New York) | 74½ | 74 |
| Postal Telegraph and Cables preferred (New York) | 67½ | 65½ |
| Western Union (New York) | 65 | 64½ |
| Westinghouse common (New York) | 72 | 68¾ |
| Westinghouse preferred (New York) | 118 | 117 |

## DATES AHEAD.

Mississippi Electric Association. Annual meeting, Hattiesburg, Miss., April 12-14. Secretary, H. F. Wheeler, Hattiesburg, Miss.

Georgia Electrical Contractors' Association. Annual meeting, Atlanta, Ga., April 15. Secretary, T. H. McKinney, Atlanta, Ga.

American Institute of Electrical Engineers. Industrial Power meeting, Pittsburgh, Pa., April 15-16. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

Iowa Section, National Electric Light Association. Annual convention, Keokuk, Iowa, April 20-22. Secretary,

W. H. Thompson, Jr., Des Moines,

American Electrochemical Society. Annual meeting, Hotel Chalfonte, Atlantic City, N. J., April 22-24. Secretary, J. W. Richards, South Bethlehem, Pa.

Arkansas Association of Public Utility Operators. Annual meeting, Little Rock, May 11-13. Secretary, W. J. Tharp, Little Rock, Ark.

Gas, Electric and Street Railway Association of Oklahoma. Fourth annual convention, Oklahoma City, May 12-14. Secretary, H. V. Bozell, Norman, Okla.

Southwestern Electrical and Gas Association. Eleventh annual convention, Galveston, Tex., May 19-22. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

Missouri Public Utilities Association. Annual convention, Steamer *Quincy*, May 27-30. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

National Electric Light Association. Annual convention, San Francisco, Cal., June 7-11. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

# With the Electrical Manufacturers

**The C. & C. Electric and Manufacturing Company,** Garwood, N. J., announces that Mr. William Siebenmorgan, formerly chief engineer of the company, is no longer connected with the organization.

**The Lagonda Manufacturing Company,** Springfield, O., has just published a booklet entitled "Lagonda Boiler-Room Specialties." It describes and illustrates the company's several types of boiler-tube cleaners with latest improvements and boiler quick-repair tools. It also covers the automatic cut-off valve and multiple strainers. A copy of the booklet may be had on request.

**National Carbon Company,** Cleveland, O., has issued a little booklet, entitled "In the Days of Ramesis II," which tells of the finding of an ancient Egyptian tablet the interpretation of whose inscription formed the basis for selecting three pyramids as the company's new trade-mark on carbon brushes. The significance is that they will endure as long as the pyramids and be as fit for the service intended.

**Oshkosh Manufacturing Company,** Oshkosh, Wis., has made arrangements with the H. B. Squires Company of San Francisco and Los Angeles, Cal., and Portland, Ore., to handle its entire line of outside construction tools and specialties on the Pacific Coast. Mr. Squires has for many years been connected with the manufacture and sale of similar tools and is therefore thoroughly conversant with the line and this with his long past association with Pacific Coast jobbers makes him a valuable addition to the list of "Oshkosh Representatives."

**Connecticut Telephone & Electric Company,** Meriden, Conn., announces that on account of the rapid increase in its business it has been necessary to make an extension to its plant by another addition approximately 50 by 100 feet in area. This building when completed will have four floors and a basement, and will be of modern brick mill construction with all up-to-date appliances. This building will be completed for occupancy by April 15, and will be largely devoted to the manufacture of Connecticut automatic igniter systems. This makes the third modern extension to the manufacturing plant within the last few years.

**The Adapti Manufacturing Company,** 919 West Street, Cleveland, O., suffered some considerable damage from fire last week. Owing to the fireproof construction of the building and the use of iron shutters sufficient protection had been secured so that while the company suffered a good deal of damage from water, it has been able, by putting forth extraordinary efforts, to resume operations. The company has a large stock of material on hand which has not in any way been injured by either fire or water, and will be able to take care of all orders promptly. In a few days more it will be in as good a position as ever for manufacturing on a full-capacity bassi.

**Engineering Department,** National Lamp Works of General Electric Company, Cleveland, O., has just issued a bulletin entitled "Lighting of Billboards and Large Painted Signs." The subject of glare is discussed and data for its elimination are set forth. Distribution curves for various types of units and illumination curves taken on a test board are shown. Specifications for correct illumination of signs of this nature are included, together with technical data on the lamps required. The bulletin contains information and suggestions as to the mechanical as well as the electrical features of this type of sign and should prove of value to those interested in sign lighting.

**The Star Mica Mining Company, Incorporated,** Canaan, N. H., is the producer of plate mica of all sizes, mica disks and washers one inch and two inches in diameter, feldspar and clear scrap mica put up in 100-pound sacks. The company's mine is located on Tugg Mountain, about three and one-quarter miles from Canaan, N. H The property of the company consists of about 150 acres of land, through which run some of the finest fissure mica veins in the mica belt. The supply of mica appears to be unlimited, and is of the finest quality. In addition to the mica formation the property contains extensive formations of quartz and feldspar of the highest grade. Samples will be sent to those interested on request, and the company invites correspondence with regard to full information respecting prices.

# Record of Electrical Patents.

## Issued by the United States Patent Office, March 23, 1915.

**1,132,552. Elevator Signal System.** J. D. Bowne, New York, N. Y., assignor to Elevator Supply & Repair Co. Resetting mechanism for electrically operated lamp-signal system.

**1,132,558. Type-Writing Machine.** S. E. Carlin, assignor to Underwood Computing Machine Co., New York, N. Y. Motor-driven.

**1,132,568. Electric Signaling.** R. A. Fessenden, assignor to S. M. Kintner, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Comprises sending wireless waves at high frequency, recording them along with the effects of disturbances and reproducing the record at lower speed to eliminate the effect of the disturbances.

**1,132,569. Wireless Telegraphy.** R. A. Fessenden, assignor to S. M. Kintner and H. M. Barrett. Means for increasing radiation efficiency of antenna comprising auxiliary conductors arranged tangentially to the spherical wave form emitted by the antenna.

**1,132,582. Train-Control System.** D. L. Hopkins, Bryson, N. C. Electromagnetic control for track ramp.

**1,132,588. Wireless-Telegraph Receiving Apparatus.** S. M. Kintner and J. W. Lee, assignors to S. M. Kintner, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Heterodyne receiver includes a finding receiver, a switch to selectively connect either receiver with the antenna and a means for varying the antenna tuning to cause the finding receiver to respond with maximum effect and simultaneously to tune the heterodyne receiver to the waves being received.

**1,132,589. Spark Gap.** F. H. Kroger, assignor to S. M. Kintner and H. M. Barrett. Plural spark gap comprising series of pairs of concentric cylinders.

**1,132,591. Electrical Measuring Apparatus.** M. E. Leeds, assignor to Leeds & Northrup Co., Philadelphia, Pa. Special reading instrument for thermocouple.

**1,132,602. Starter-Control for Explosive-Engines.** H. A. Myers, Toledo, O., assignor of one-half to A. S. Hickok. A single switch simultaneously closes the starter and battery circuits and then opens them and closes the magneto circuit.

**1,132,604. Electric Fluid-Heater.** T. J. Nash, Lincoln, Nebr. Water passes between concentric electrodes.

**1,132,605 and 1,132,606. Signal Apparatus.** H. F. Newbury, assignor to Elevator Supply & Repair Co., Chicago, Ill. Elevator signal systems with signal switch controlled by car movement.

**1,132,607. Elevator Signaling System.** E. R. Newell, assignor to Elevator Supply & Repair Co. Electric floor signaling system.

**1,132,613. Telephone Transmitter.** J. C.

R. Palmer, assignor to Western Electric Co. Relates to electrode chamber.

**1,132,653. Centrifugally Operated Contact Device.** C. G. Cunningham, New York, N. Y. Gear-driven centrifugal switch mounted in cabinet.

**1,132,654. Automatic Circuit-Controlling Apparatus.** C. G. Cunningham. Modification of above.

**1,132,659. Time-Recording Apparatus.** A. C. Jackson, assignor to Miller Lock Co., Philadelphia, Pa. Electric program clock with recorder, both controlled from master clock.

**1,132,671. Protecting Casing for Line Conductors.** T. E. Murray, New York, N. Y. Metal molding with three parallel channels in base and cover for middle channel only.

**1,132,672 and 1,132,673. Junction Box.** T. E. Murray. First type has a number of parallel channels with lateral wall openings on each side; second type provided tubular offsets from the opposite sides.

**1,132,674. Electric Fuse.** T. E. Murray. Cartridge fuse of special construction.

**1,132,676. Multiduct.** T. E. Murray and A. V. A. McHarg, New York, N. Y.; said McHarg assignor to said Murray. Rectangular sheet-metal tube with crenelated partition sheet-metal plates.

**1,132,684. Roasting of Compounds or Ores Containing Zinc.** A. L. J. Queneau, Philadelphia, Pa. Electric furnace process.

**1,132,700. Lock Switch for Electric Circuits.** S. M. Blake and J. W. Bates, Minneapolis, Minn. Key can be removed in either extreme position but not in middle position.

**1,132,727. Locomotive.** N. D. Levin, assignor to Jeffrey Mfg. Co., Columbus, O. Special motor mounting for mine locomotive.

**1,132,733. Magneto Adjustment.** C. B. Rose, assignor to Velie Motor Vehicle Co., Moline, Ill. Chain and sprocket adjustment.

**1,132,734. Supporting Structure for Trolley Conductors.** W. Schaake, assignor to Westinghouse Electric & Mfg. Co. Steadying arm for catenary trolley.

**1,132,739. Spool-Winding Machine.** C. Scott, assignor to Otis Elevator Co., Jersey City, N. J. Motor-driven machine for winding insulated wire is automatically stopped by any irregularity in the wire.

**1,132,740. Cable-Reeling Mechanism for Electric Locomotives.** F. L. Sessions and D. T. Fisher, assignors to Jeffrey Mfg. Co. Operated by vertical motor.

**1,132,741. Controller for Alternating-Current Motors.** A. Simon, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Each accelerating step is checked until normal conditions exist in each phase.

**1,132,750. Electric Switch for Portable Electric Lights.** B. Tauber, assignor to Interstate Electric Novelty Co., New York, N. Y. Sliding switch to engage battery terminal.

**1,132,751. Portable Electric Light.** B. Tauber, assignor to Interstate Electric Novelty Co. Modification of above.

**1,132,755 Door Lock.** B. E. Westlin, assignor to Otis Elevator Co. Electric circuit cannot be closed while door is open and door cannot be opened while circuit is closed.

**1,132,765. Coil-Taping Machine.** W. Deats, Yonkers, N. Y. Electrically driven and controlled with automatic stop motion.

**1,132,769. Traction Elevator.** E. L. Gale, Sr., assignor to Otis Elevator Co. Motor-driven high-speed elevator.

**1,132,770. Safety Device for Elevators.** E. L. Gale, Sr., assignor to Otis Elevator Co. Speed-controlled brake interconnected with electrical control.

**1,132,772. Circuit-Interrupter.** F. W. Harris, assignor to Westinghouse Electric & Mfg. Co. Special release for circuit-breaker.

**1,132,776. Horizontal Arc Lamp.** H. W. Hobbs, Portland, Me. Motor-driven feed regulator.

**1,132,777. Automatic Pressure-Controller.** C. S. Jennings, assignor to Lamson Co., Newark, N. J. Motor-driven air pump with special motor control.

**1,132,783. Electromagnet.** W. D. Lutz, assignor to Otis Elevator Co. Ring type with special pole-piece construction.

**1,132,786. Circuit-Interrupter.** J. N. Mahoney, assignor to Westinghouse Electric & Mfg. Co. Relates to toggle mechanism.

**1,132,791. Automatic Stopping Device.** J. Pagano, Memphis, Tenn. Short-circuits ignition circuit of engine.

**1,132,799. Locomotive.** F. L. Sessions, assignor to Jeffrey Mfg. Co. Framing for electric mine locomotive.

**1,132,800. Mining Machine.** F. L. Sessions, assignor to Jeffrey Mfg. Co. Has motor-driven rope-winding mechanism.

**1,132,811. Spark Plug.** J. M. Walton, New Orleans, La. Details.

**1,132,823. Sign.** E. Bambeck, assignor to American Sign Co., Kalamazoo, Mich. Lamps within the casing and lenses on the outside.

**1,132,838. Locomotive.** D. T. Fisher, assignor to Jeffrey Mfg. Co. Electric mine locomotive.

**1,132,839. Cable-Winding Mechanism for Locomotives.** D. T. Fisher, assignor to Jeffrey Mfg. Co. Motor-driven reeling mechanism for electric mine locomotive.

**1,132,846. Electric Battery.** V. Holzapfel, Jr., Bayonne, N. J. Special terminal for zinc of dry cell.

**1,132,849. Telltale Switch.** J. Howland, San Antonio, Tex. Vacuum gauge connected so that reduction in vacuum closes a bell circuit.

**1,132,852. Advertising Apparatus.** G. A. Johnson, Alameda, and P. Pedersen, San Francisco, Cal. Projecting lamp mounted on motor-driven turntable.

**1,132,864. Signaling Apparatus for Street-Railway Cars.** E. Morris, Boston, Mass. Door-operated switches close a motorman's lamp-signal circuit when all doors are closed.

**1,132,884. Electrical Recording Apparatus.** A. L. Sohm, assignor to Sohm Electric Signal & Recording Co., Spokane, Wash. Electrically controlled type bars.

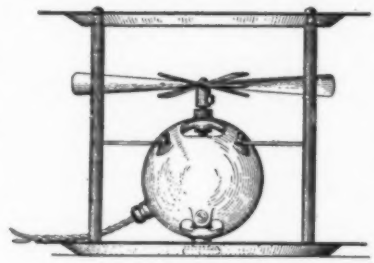
**1,132,890. Electrical Measuring Instrument.** T. W. Varley, assignor to Westinghouse Electric & Mfg. Co. Includes permanent magnets with elliptical aperture between poles and moving coil with commutator.

**1,132,896. Artist's Stippling-Pen.** F. C. Adams, London, England. Electromagnetically actuated.

**1,132,933. Apparatus for Distance Gas-Lighting.** E. W. Havers, London, England. Includes electric incandescent filament for gas ignition.

**1,132,949. Bearing for Trolley Wheels.** S. L. McAdams, assignor to Cleveland Trolley Wheel Co. Self-oiling.

**1,132,957. Electrolytic Condenser and Method of Operating the Same.** R. D. Mershon, New York, N. Y. Provides first for D. C. excitation of condenser and then for impressing higher and higher A. C. voltages upon it.



No. 1,133,027.—Table Fan.

**1,132,986. System of Charging and Discharging Storage Batteries During Forming Process.** W. A. Turbayne, Buffalo, N. Y., assignor to Central Trust Company of New York. Employs a reversible booster.

**1,132,987. Ignition Apparatus for Starting Internal-Combustion Engines.** G. Unterberg, Durlach, Germany. Magneto is connected in at higher speeds.

**1,132,989. Welding.** E. L. Walker, assignor to Hale & Kilburn Co., Philadelphia, Pa. Metallic plate has wooden strip secured thereto by metallic rods electrically welded to the plate.

**1,132,992. Dynamo-Electric Machine.** J. J. Wood, assignor to General Electric Co. Simple field structure.

**1,132,997. Switch.** V. G. Apple, assignor to the Apple Electric Co., Dayton, O. Pedal-operated push switch.

**1,133,000. Regulating Device.** A. Boury, assignor to General Electric Co. Voltage regulator for variable-speed generator.

**1,133,013. Indicator-Operating Device for Gasoline-Tanks.** C. Eberhart, Jr., Atlanta, Ga. Float-operated electric level indicator.

**1,133,023. Fluid-Level Indicator.** M. M. Hart and R. W. Carpenter, Weiser, Idaho. Electrically controlled through varying resistance.

**1,133,027. Ventilating Apparatus and Method.** P. C. Hewitt, New York, N. Y. Vertical-shaft electric table fan mounted between two trays, the upper one acting also as deflecting plate. (See cut.)

**1,133,028. Coasting-Registering Mechanism for Electric Cars.** G. H. Hill, assignor to General Electric Co. Electrically operated recorder operates from time power is shut off until brakes are applied.

**1,133,032. Oil Switch.** E. H. Jacobs, assignor to General Electric Co. Has high-resistance tank with auxiliary contacts.

**1,133,034. Selective Signal-Transmitting Apparatus.** H. Joslyn and C. L. Lynch, Seattle, Wash. Cam-operated selective switches.

**1,133,045. Time-Recorder for Vehicles.** C. E. Larrabee, assignor to International Time Recording Co. of New York, Endicott, N. Y. Electrically operated running-time and coasting-time printing recorder.

**1,133,053. Ignition Magneto Generator.** H. C. Mueller, assignor to Evinrude Motor Co., Milwaukee, Wis. Generating circuit of magneto is closed only during induction period.

**1,133,059. Electrolytic Process of Producing Copper.** M. Perreur-Lloyd, Boulogne-sur-Seine, France. Sulphur dioxide is added to the electrolyte and an active vertical circulation is produced.

**1,133,073. Heating and Cooking Apparatus.** R. F. Venner, London, England. Resistance conductor submerged in layer of oil.

**1,133,084. Elevator Safety Device.** E. Bársony, Castleton-on-Hudson, N. Y. Power switch is opened when either car or shaft doors are opened.

**1,133,098. Electric Heating and Cooking Stove.** A. O. Christensen. Franklin Furnance, N. J. Resistance wire in bottom of oven.

**1,133,111. Telephone-Exchange System.** F. W. Dunbar, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Automatically operated selective switches for distributing the calls.

**1,133,112 and 1,133,113. Telephone System.** F. W. Dunbar, assignor to Kellogg Switchboard & Supply Co. First patent provides for the use of service meters; second for selective switching of call to idle trunk circuit.

**1,133,167 Automatic Gasoline-Service.** S. F. Mioton, New Orleans, La. Electromagnetically controlled valve for tank.

**1,133,175. Reloadable Cartridge Fuse.** H. H. Oswald, Fort Ann, N. Y. The end caps have perforations exposing points on the inner frangible casing.

**1,133,176. Lightning-Rod Coupling.** E. G. Owen, Janesville, Wis. Flattened elliptical junction.

**1,133,183 Device for Igniting Fuses.** J. H. Reineke, Weitmar, near Bochum, Germany. Employs high-frequency source and means to prevent ignition of fuse except by high frequency.

**1,133,187 System of Electrical Distribution.** G. B. Schley, assignor to Allis-Chalmers Mfg. Co. Includes storage battery and booster.

**1,133,197. Electric Gang Fitting.** G. B. Thomas, assignor to Perkins Electric Switch Mfg. Co., Bridgeport, Conn. Suspension frame for mounting a set of switches side by side.

**1,133,231. Lamp-Holder.** H. C. L. Holden, assignor to United Motor Industries, Ltd., London, England. Flexibly mounted bayonet socket.

### Patents Expired.

The following United States electrical patents expired on March 29, 1915:

601,233. System of Electrical Distribution. W. L. Bliss, Brooklyn, N. Y.

601,263. Combined Rail Joint and Bond. H. R. Keithley, New York, N. Y.

601,268. Electric Arc Lamp. P. F. Krug, New York, N. Y.

601,276. Electric Switch. O. S. Platt, Bridgeport, Conn.

601,286. Fusible Cutout. F. Schwedtmann, St. Louis, Mo.

601,301. Safety Device for Electric Elevators. J. D. Ihlder, Yonkers, N. Y.

601,318. Regulator for Organs Having Electrical Air Pumps. L. K. Fuller, Brattleboro, Vt.

601,351. Electric Lighter for Gas Burners. L. V. Lewitzki, Brussels, Belgium.

601,357. Means for Supporting Electric Wires. B. D. B. Smock, Wickatunk, N. J.

601,366. Method of and Apparatus for Producing Calcium Carbide. C. L. Wilson, C. Muma, J. W. Unger, H. Schneckloth, A. P. Brosius and J. C. Kuchel, Holstein, Iowa.

601,367. Electric Furnace for Manufacturing Calcium Carbide. C. L. Wilson, C. Muma, J. W. Unger, H. Schneckloth, A. P. Brosius and J. C. Kuchel.

601,396. Cataphoric Electrode Support. M. W. Hollingsworth, Philadelphia, Pa.

601,412. Wire Holder. F. Canfield, Boulder, Colo.

601,454. Clamping Buckle for Electric Line Wires. A. H. Weikman, Palmyra, N. J.

601,458. Electric Rail Bond. F. W. Atkinson, Chicago, Ill.

601,471. Storage Battery. C. F. Kaufman, Chicago, Ill.

601,482. Electric Railway Signaling System. B. Samuels, St. Joseph, Mo.

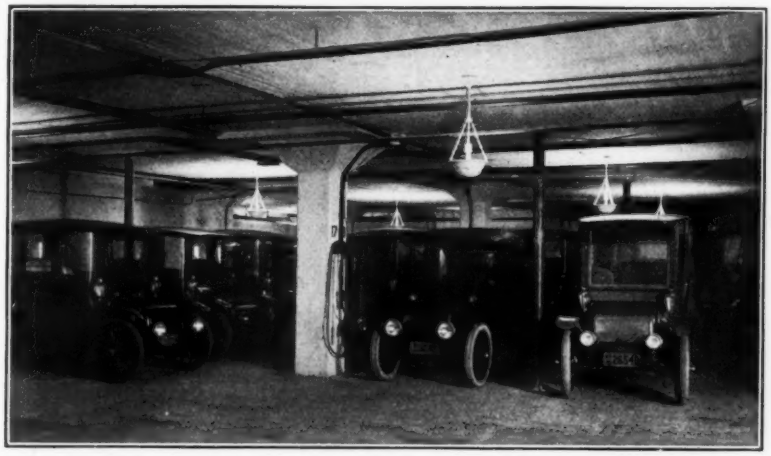
601,492. Automatic Cutout. H. F. Blackwell, Jr., Brooklyn, N. Y.

601,585. Electric Heater. J. F. McElroy, Albany, N. Y.

# Electric Vehicle Section

## New York's Co-operative Electric Garage.

The new co-operative electric garage of the New York Electric Vehicle Association, at Central Park West and Sixty-second Street, New York City, is now in full operation with a quota of 100 electric pleasure cars housed and cared for beneath its roof and the entire project is succeeding beyond the fondest hopes of its originators. The task of organizing the largest electric garage in New York City was no easy one and has been accomplished successfully by the Association with the aid of three of the leading makers of electric pleasure cars, Detroit, Baker and Rauch & Lang, all of whom have made the new garage their New York headquarters with handsome showrooms on the ground floor facing Central Park. The cost of garage service for the ordinary electric is $45 per month, including washing, cleaning, charging and battery inspection.



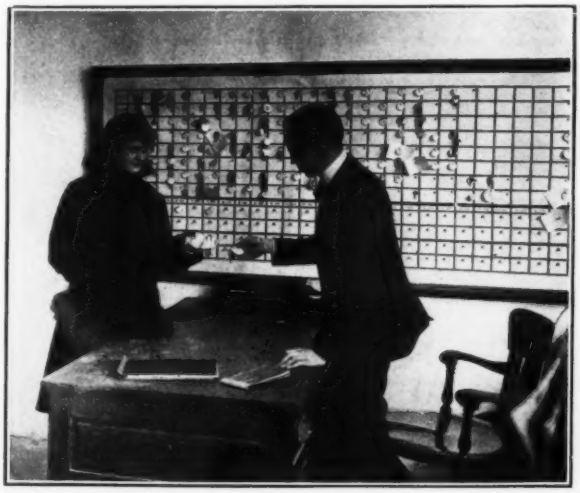
General View of Main Floor of New York Co-operative Electric Vehicle Garage.

The building, a two-story and basement reinforced-concrete structure, has a total floor area of 30,000 square feet, more than half of which is devoted to storage of vehicles and the rest to the showrooms referred to above, to offices, service and stock rooms and repair shops. The whole plant is exclusively devoted to pleasure vehicles. All rooms are very well lighted by the indirect lighting system, having nitrogen-filled tungsten lamps of 100 candlepower. A three-ton electrically operated elevator lifts the vehicles to the upper floor or basement.

Electric current is furnished by the New York Edison Waterside Stations Nos. 1 and 2 on the East River. The six incoming feeders enter the building in the basement just beneath the charging switchboard on the floor above. There are 8,000 feet of large copper wire used in the garage and 1,400 feet of conduit, exclusive of connecting cables. These 750,000-circular-mil cables have a combined capacity of 3,200 amperes and 120 volts or about 400 kilowatts.

The charging switchboard consists of five slate panels with a swinging bracket on each side for ammeter and voltmeter; in addition to the standard equipment of each panel, the middle panel has a balancing ammeter and a regulating device. The switchboard proper with its complete equipment was furnished by the Cutler-Hammer Manufacturing Company.

There are altogether 48 charging outlets, arranged so that all of the cars can be charged in their regular positions without shifting or moving. Of these outlets 28 are rated as 25-ampere outlets, 18 are 50-ampere outlets, and



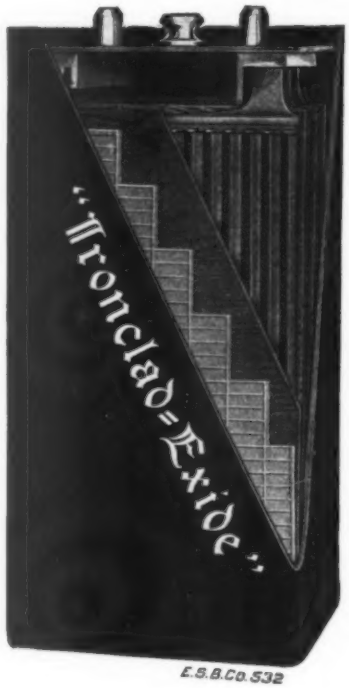
Office of New York Electric Vehicle Garage, Showing Key Rack and Method of Identifying Subscriber.

Cleaning Floor of New York Electric Vehicle Garage, Showing Method of Suspending Water Pipes from Ceiling.

# "Ironclad-Exide"

## The Battery for Commercial "Electrics"

### "DOING ITS DUTY EVERY DAY"



E.S.B.Co. 532

The "Ironclad-Exide" Battery is in its fifth year of successful service. Its record for the past four years stands as absolute proof of the correctness of its design.

It is unquestionably the battery for commercial service. It is reliable—day-in and day-out—every day in the year. No delays—no fuss—no inconveniences. *Always dependable.*

It is the battery for big loads—rough or hilly roads—*hard service.*

The "Ironclad-Exide" Battery hauls the most for the longest time with the least trouble and at the least expense.

It is economical to use and economical to maintain. *It's good when new and it stays good.* It's a business battery for business men.

It is used by the largest electric vehicle users in the country.

It is the battery for Central Stations to endorse. It makes friends—it saves regrets.

These are our claims for the "Ironclad-Exide" Battery. More convincing, however, is *"what the other fellow says."* Get a copy of the new "Ironclad-Exide" testimonial book. It contains letters from vehicle owners who have used one or more "Ironclad-Exide" Batteries for three years or over.

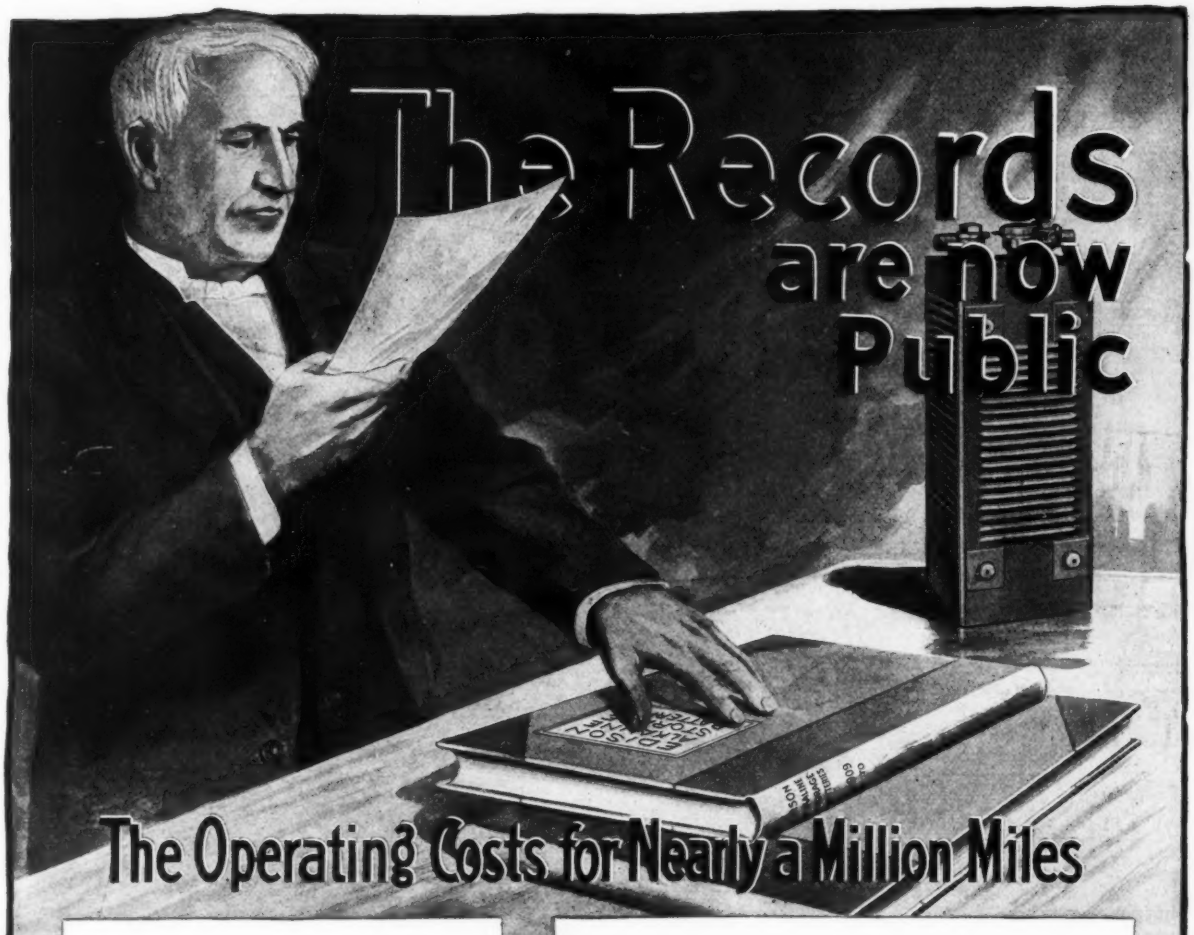
# THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of

The "Chloride Accumulator", The "Tudor Accumulator"

The "Exide", "Hycap-Exide", "Thin-Exide" and "Ironclad-Exide" Batteries

New York Boston Chicago Washington **PHILADELPHIA, PA.** Denver San Francisco Seattle St. Louis
Cleveland Atlanta Pittsburgh Detroit **1888-1915** Rochester Los Angeles Toronto
886 "Exide" Distributors 12 "Exide" Depots "Exide" Inspection Corps

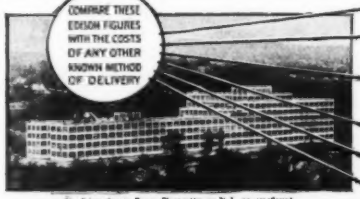



# The Operating Costs for Nearly a Million Miles

I CLAIMED that the **New Alkaline Storage Battery** would make the Electric Vehicle the cheapest means of Street Transportation, but I had only my private tests to satisfy me. Today thousands of Edison Batteries in thousands of Trucks and Delivery Wagons are making Operating Records that are easily investigated by all. After the four or five years of hard service that many of these vehicles have had, is it possible to deny that my claim is proved?

*Thomas A. Edison*

**HERE IS ONE RECORD—A REPORT—ON 22 FIVE-YEAR-OLD EDISON BATTERIES**




The Edison Storage Battery Plant at Orange, N. J., was not affected by the fire in the Edison Phonograph Works on December 9th.

Write for Bulletins on the use of **Edison Batteries** for Lighting Country Houses, Ignition and Lighting of Gasoline Cars, Yacht Lighting, Railway Train Lighting and Signaling, Telephone, Telegraph and Wireless *and High-priced or Low-priced Passenger Electrics.*

**Edison Storage Battery Company**

Orange, New Jersey

*Distributors in* { New York, Chicago, Boston, Cleveland, Washington, San Francisco, Los Angeles, Portland, Oregon, Seattle

ADAMS EXPRESS COMPANY

242 WEST 47TH STREET

MOTOR VEHICLE DEPARTMENT
GEORGE STEVENS
SUPERINTENDENT

NEW YORK, December 7th 1914

Edison Storage Battery Company,
Orange, N. J.

Attention of
W. A. Bachman,
V.P.& Genl Mngr.

Gentlemen:-

Thank you for consenting to extend from five to six years the conditions of your guarantee regarding renewal of positive plates.

The average operating cost per battery per month of the twenty-two trucks at Indianapolis, equipped with Edison Batteries in November 1909 and averaging about 660 miles per month, is as follows:-

| YEAR | BATTERY MAINTENANCE (Refilling, new solution, watering, cleaning, all repairs, inspection, etc.) Material | Labor | CURRENT (Purchased by meter) | TOTAL |
|---|---|---|---|---|
| 1910 | $3.47 | $4.10 | $10.05 | $17.62 |
| 1911 | 3.41 | 4.10 | 8.93 | 16.44 |
| 1912 | 3.41 | 4.10 | 9.90 | 17.41 |
| 1913 | 2.86 | 4.10 | 8.17 | 15.13 |
| 1914(to Oct.31) | 3.11 | 4.10 | 9.50 | 16.17 |

The average total operating cost per battery per month has, therefore, been $16.55 for a period of five years. In this time the average mileage per truck was about 40,000, which reduces the operating cost to 4.02¢ per mile. The batteries are still in service.

Yours very truly,

Geo. Stevens

Superintendent

GS•REW

**Electric Garage**
**Daily Charging Record** Name Anderson Garage
Make of Car Detroit Address 20 Central Park W
Date March 3 1915 42 Bells Registration No. M 1158

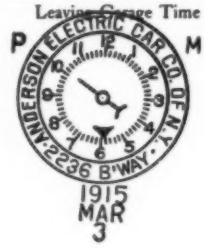
Starting Rate Amperes 25 | Finishing Rate Amperes 12 | Charging Plug Number 37 | Switch Board Attendant S.S.

| | Finishing Rate Amperes | Finishing Rate Volts | Charging Plug Number | Switch Board Attendant | | On / Off | Amperes | Volts |
|---|---|---|---|---|---|---|---|---|
| | Amperes | Volts | | Amperes | Volts | | | |
| 5 PM | | | 10 | 36 | 92 | 3 | 14 | 105 |
| 5:30 | | | 10:30 | 36 | 95 | 3:30 | 12 | 105 |
| 6 | | | 11 | 36 | 96 | 4 | 12 | 105 |
| 6:30 | | | 11:30 | 37 | 98 | 4:30 | 10 | 104 |
| 7 | | | 12 M | 32 | 98 | 5 | 10 | 104 |
| 7:30 | | | 12:30 | 28 | 99 | 5:30 | | |
| 8 | | | 1 | 28 | 101 | 6 | | |
| 8:30 | | | 1:30 | 24 | 104 | 6:30 | | |
| 9 | | | 2 | 24 | 104 | 7 | | |
| 9:30 | 36 | 90 | 2:30 | 14 | 105 | 7:30 | | |

The Electric Garage Daily Charging Record.

Car Owner's Name Anderson Garage
Address 20 Central Park W Car No. 05
Delivery of Car ✓ Calling for Car ____ Driver's Name Gibbons

Leaving Garage Time




Returning Time

Record Showing Leaving and Returning Time.

**Electric Garage**
**Defective Car Report** Name Anderson Garage
Make of Car Detroit Req No 20 Central Park W
Date March 3 Time in ____ Driver Gibbons

Drivers must report all defects IMMEDIATELY using this card

Reed by ____ Supt | Insp by ____ | Repairs by ____

The following parts require attention:

Brakes stick

Repairs O K

____ Supt

Defective Car Report.

**Electric Garage**
**Daily Report** Name Anderson Garage
Make of Car Detroit Address 20 Central Park W
Date March 3, 15 Time In ____ Registration No. M 1158

| | | | |
|---|---|---|---|
| Washed Bill | Cleaned Sam | Polished Handy | |
| Oiled S.J.M. | Mechanical Inspection H.V.D. | Electrical Inspection H.N. | |
| Tires OK | Equalized ____ | Charging | Connected by Fred Time 9:30 |
| Odometer 3670 | Ampere-hour Meter ____ | | Disconnected by Leo Time 5:30 |

Instructions

Daily Maintenance Report.

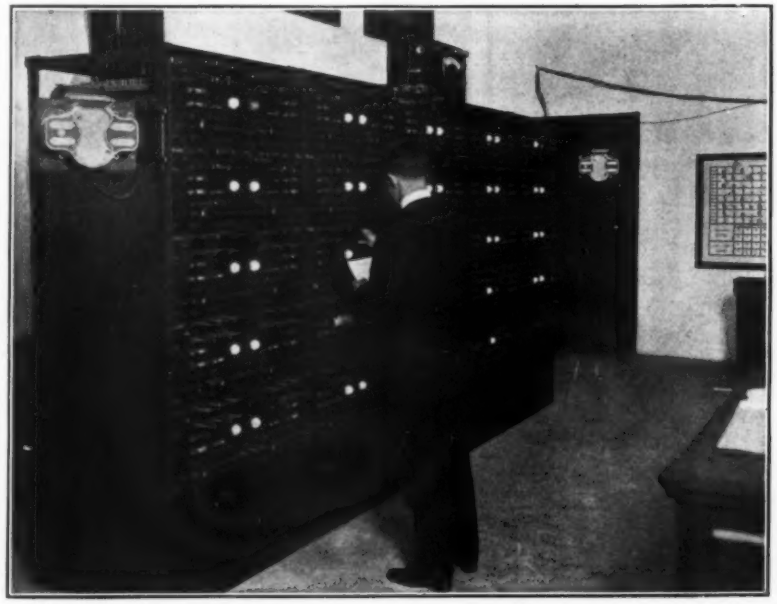
two 100-ampere outlets for heavy charging and boosting. The 25-ampere outlets can run up to 35 amperes, the 50-ampere up to 60 amperes. The equipment can take care of all batteries ranging from 24 lead cells with a charging rate of 8 amperes, to an Edison battery of 60 cells requiring a charging rate of 100 amperes. The total capacity of the plant is 2,500 amperes.

After the plug has been connected to the vehicle, a signal is automatically flashed at the switchboard, indicating that the switch can be thrown in for charging the batteries. The average charging time is from four to six hours. The attendants enter on an index card each half hour the amount of current furnished, and the battery voltage. The time of charging, number and name of owner of car and other data to make the record complete are also put on the card. This record and other card records made each day are shown herewith.

As each automobile has its own key at the office, a large keyboard is provided with numbers and names of the owners of the vehicles. When telephone calls come in to call for a car or that a car should be delivered at a certain hour, small round pasteboard cards with eyelets are hung on the particular section, so that the attendants may readily see at any time throughout the day or night without consulting an index card system what must be done in the particular hour.

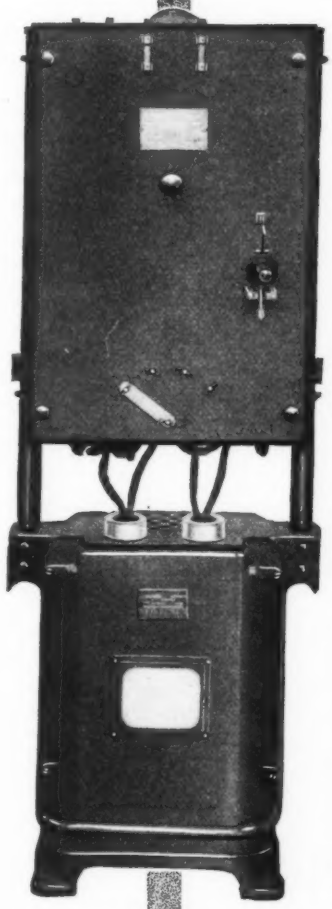
The garage and office are open all day and night. It is under the charge of Harvey Robinson, of The New York Edison Company, who is also chairman of the New York Section of the Electric Vehicle Association of America.

The service rendered by the co-operative garage is doing much to popularize the use of the electric and the present indications point to an early extension of facilities.



Automatic Indicating Panel-Type Switchboard.

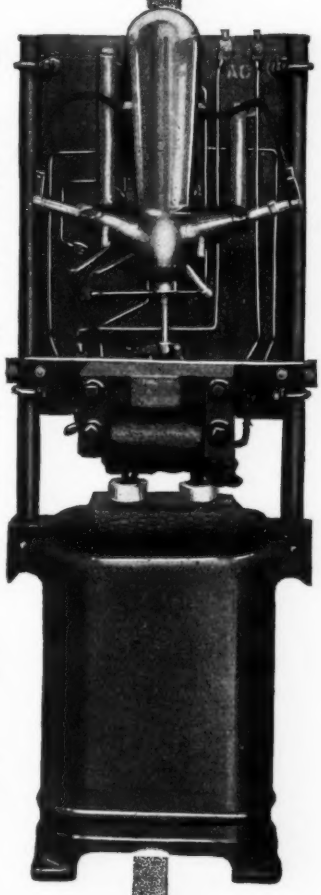
This Trade Mark The Guarantee of Excellence on Goods Electrical.



# A new low-priced G-E Rectifier

## for

## Charging Electric Vehicles



A simplified economical Mercury Arc Rectifier for charging batteries ranging from 38 to 46 cells of lead or the equivalent in Edison, from 220 volts, 60 cycles.

This new G-E Rectifier is adaptable to either rapid or slow charging.

It is the ideal outfit for the private garage—charging the electric at home.

It is easily operated by anyone who can run an electric car.

It occupies small floor space and requires no oil or grease.

It can be used with equal facility for charging batteries for light commercial cars.

The above points make a strong appeal to the owners of electric pleasure and about town business cars.

To the Central Station the G-E Mercury Arc Rectifier is always a good proposition for increasing the night load.

Send to our nearest office for further particulars.

# General Electric Company

List of Sales Offices on Second Page Before Editorial Section

5406

This Trade Mark The Guarantee of Excellence on Goods Electrical.

## New Type of Electric Automobile.

A new type of electric automobile has been announced, the invention of Harry E. Dey, an electrical engineer of New York City, to be developed by the Dey Electric Vehicle Syndicate. It is understood that a group of eight professional men, of which Dr. Charles P. Steinmetz is a member, and Captain Max E. Schmidt, of New York, is chairman of the board of managers, will finance the development. A three-passenger runabout type of car, incorporating Mr. Dey's ideas, is being built and will be brought down to between 1,100 and 1,200 pounds, and it is expected that the price will come somewhere around $750.

The entire driving mechanism is made a part of the rear axle, and a great number of accessory elements necessary to the construction of the automobile of today are said to be eliminated. The following extract from an interview in the New York *Times* of March 24 gives the views of Dr. Steinmetz with respect to the new vehicle.

"It is beautifully simple," said Dr. Steinmetz. "In every electric motor, as you know, there are two chief parts, the field and the armature. In the ordinary motor the field is stationary and the armature revolves. In certain motors this rule has been reversed and the armature held stationary while the field revolved. But in this power plant something quite revolutionary takes place. Both field and armature revolve. This unique motor is incorporated in the rear axle. The field portion drives one of the rear wheels of the car and the armature portion the other wheel, so that in this way the motor acts as its own differential.

"But this is by no means all. By reason of this type of action, the motor is doubled in power. For example, if, in an ordinary motor, the armature were to revolve at the rate of 1,500 revolutions a minute, it would here be revolving at a rate equivalent to 3,000 revolutions a minute because the field would be adding its independent 1,500 revolutions. It can be appreciated readily, therefore, that this motor will either require half the current to drive it with equal power, or that it will show double power on the same amount of current.

"This does not mean any enormous increase in mileage on a single charge of the storage battery. Rather it means that a comparatively light battery may be used with satisfactory results. Moreover, doing away with the motor separate from the axle and attached to it by shafting has other interesting advantages. In the first place, it frees the bottom of the car body so that the battery alone need be carried there. This means the saving not only of the space actually necessary for the motor itself, but also of the space used by supports, cross-members and braces to hold the motor in place.

"Secondly, this arrangement brings about a great saving in weight by making it possible to lighten the whole construction of the frame, since a far less rigid structure is needed when there is no shafting and no bevel gearing to keep in mesh. The advantages of the device are cumulative.

"I see no reason why a simplified electric of this character," Dr. Steinmetz continued, "should not be made, under quantity production, to sell for as little as the cheap but good gasoline car—or for less. It is far more simple and it should be lighter by many pounds. We hope to get this car within the thousand-pound limit. As to price, that, of course, must depend on the method and extent of manufacture. One reason why electric automobiles cost so much today is that they are made by the hundreds. Economic car production should be by the hundred thousands, as has been shown in the field of the gasoline car.

"Of course this power plant is applicable to any kind of electric vehicle that does not run upon a track—the light delivery truck, the heavy duty truck, even the lawn mower, as well as the pleasure car of all types. It is not its application that interests me so much as the thing itself; a step forward, very decidedly."

In addition to the driving part of the car, Mr. Dey has perfected a system of control in connection with it, which Dr. Steinmetz also described with enthusiasm.

"By this control," he said, "the necessity for using brakes, except under unusual circumstances, is done away with. Its technical side need not be gone into at the present time, but its effect is to make the motor act as its own brake and also to prevent it from slowing down so greatly on up-grades. This feature of swiftly dropping speed in going uphill has always been against the electric. This is because with more work to do the field of the motor become more highly magnetized and does not allow the armature to revolve so rapidly. This feature is minimized by this new control so that there is far less diminution of speed on the up-grade.

"On the down-grade the same control features make for very satisfactory operation. On a long hill, under ordinary circumstances, the brakes would have to be used a great deal. But with this control and motor, if the former be set at the half speed position the motor will act as a brake as soon as a speed equivalent to half speed on the level is reached through momentum.

"It will do more than that. As soon as the speed called for by the half-speed position is passed, the motor acts as a generator and begins to put back current into the battery. Of course this does not mean perpetual motion," the doctor said smilingly. "You do not put back as much current going down the hill as you have drawn out of the battery going up, but you do boost the battery to an important extent, nevertheless.

"I have made some tests to show just what this boosting amounts to. I find that the motor begins to act as a generator, that is, feed back to the battery when a grade of two and one-half per cent is reached. If the control is set at the half-speed position it feeds back full power; that is to say, it charges the battery with current at the rate that the battery gives out current when running on the level—at a grade of seven and one-half per cent. If you go down the hill at full speed, which is not infrequently possible on long hills with good roads, you charge back full power on a 5 per cent grade.

"These tests, naturally, were made with a car of a specific weight, and the percentages would vary somewhat with the weight of the machine, but they indicate the principle involved and the possibilities of this new system of control. It is very convenient to be able at least partially to eat your cake and have it, too."

Asked as to the manufacturing plans of the Dey Electric Vehicle Syndicate, as the group of men who have perfected this car is called, Dr. Steinmetz responded that that was uncertain. He was not sure, he said, whether the syndicate would undertake manufacture itself or issue licenses to manufacture under its patents. This was a matter still under discussion, he added. He was emphatic, however, about the opportunity which the inventions opened up for quantity production of electrics to sell at a price in competition with low-priced and popular gasoline machines.

"There is nothing that I can see," he concluded, "to prevent this electric from being put out under quantity production methods. From the scientific side it appeals to me very much. It is so nice and simple."

## Edison Electrics in England.

Bernard Drake, chairman of the British firm of Edison Accumulators, Limited, reported at the annual meeting of that company, held in London, on March 12, that in initiating the electric-

# Books on Electric Vehicles

## "The Electric Vehicle Hand-Book"

**By H. C. Cushing, Jr. and Frank W. Smith**

Fellow Am. Inst. Elec. Engrs., Publisher of "The Central Station," the official organ of the Electric Vehicle Association of America. President Electric Vehicle Association of America and Vice Pres. United Electric Light & Power Co., New York.

362 Pages, Fully Illustrated, Flexible Leather Cover, Pocket Size. **Price, $2.00.**

**CHAPTERS**

I.—Electric Vehicle Development. By William P. Kennedy, Consulting Transportation Engineer.
II.—Lead Storage Batteries; Descriptive Lead Batteries; Charge and Discharge Rates; Care of Storage Batteries.
III.—Care of Lead Storage Batteries; Assembling and Putting New Batteries into Condition; Charging; Charging Overnight; Emergency Charging; Inspection; Electrolyte; Cadmium Readings; Lead Burning.
IV.—Commercial Types of Lead Storage Batteries.
V.—Alkaline Storage Batteries; Description and Care.
VI.—Charging Apparatus and Charging Stations; Alternating Current Apparatus; Isolated Plants.
VII.—Measuring Instruments, Electrical and Mechanical.
VIII.—Wheels, Rims and Tires; Their Care.
IX.—The Motor Construction and Care.
X.—The Controller, Construction and Care.
XI.—The Chassis, Its Components, Their Upkeep.
XII.—Association and Publications Identified With the Development of the Electric Vehicle.
XIII.—Comparative Cost Data. ..

## The Automobile Hand-Book

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**Revised and Enlarged 1911 Edition. 16mo, over 650 Pages and over 320 Illustrations. Full Leather Limp, Round Corners, Red Edges. Price $2.00.**

**The automobile hand book is a work of practical information for the use of owners, operators and automobile mechanics, giving full and concise information on all questions relating to the construction, care and operation of gasoline and electric automobiles, including road troubles, motor troubles, carbureter troubles, ignition troubles, battery troubles, clutch troubles, starting troubles. With numerous tables, useful rules and formulas, wiring diagrams and over 320 illustrations.**

**Power transmission is thoroughly discussed, and the various systems of transmitting the power from the motor to the driving axle are analyzed and compared.**

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## Electrical Review and Western Electrician

**Western Headquarters for Electrical Books**

**608 S. Dearborn St.**
**CHICAGO**



GMC
GENERAL MOTORS COMPANY
TRUCKS

# *Develop Your Off-Peak Load*

Many central stations both in large and small communities are aggressively encouraging the use of electric commercial vehicles.

And their efforts are showing up on the credit side of the balance sheet.

The charging of electric truck batteries is a night demand. It is off-peak, and therefore extra profitable. A five-ton truck is five times as great a user of current as the average residence and will average a monthly bill of over $20.

Why not add electric truck connections to your lines?

Take the initial step by sending for information regarding GMC Electric Trucks. We build 8 capacities, from 1000 lbs. to 6 tons and will gladly explain their adaptability to the requirements of your territory.

We also build a complete line of Gasoline Trucks. We can supply a truck to fit any service condition.

**GENERAL MOTORS TRUCK CO**

*One of the Units of General Motors Company*
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vehicle industry in England they must be constantly running demonstration cars and following up inquiries in such a way as to educate the public concerning the results obtainable under various working conditions. It had been necessary to prepare special designs to suit the conditions prevailing in England which in many cases differed from those in America and elsewhere. The company has obtained orders for upwards of one hundred electrics and one London firm will shortly have fifty Edison battery delivery vans in regular service.

At the end of 1914 the company had sufficient unexecuted orders on its books to have enabled a profit to be shown if it had been possible to obtain the equipments in time. The net loss for the year was $8,345. Encouraging reports were coming in respecting their vehicles at work, the cost per ton-mile comparing very favorably with other road-transport systems, while reliability, ease of manipulation and quiet running were all good points. Cost of generating and supplying current was steadily decreasing, whereas the cost of gasoline or other fuel for the internal-combustion-engine commercial and private cars had been continuously rising.

Mr. Edison was reported to have said that in his opinion the nickel-iron-alkali battery would play an important part in the transportation of the future, and this statement was already verified in America, but in England they were slow to move in anything new and it was often difficult to overcome the want of enterprise shown by the older establishments, stores, cartage contractors and other firms, who waited for their more up-to-date competitors to show what could be done. Orders received by the Edison company since December were over three-fifths of the total received during the entire previous year.

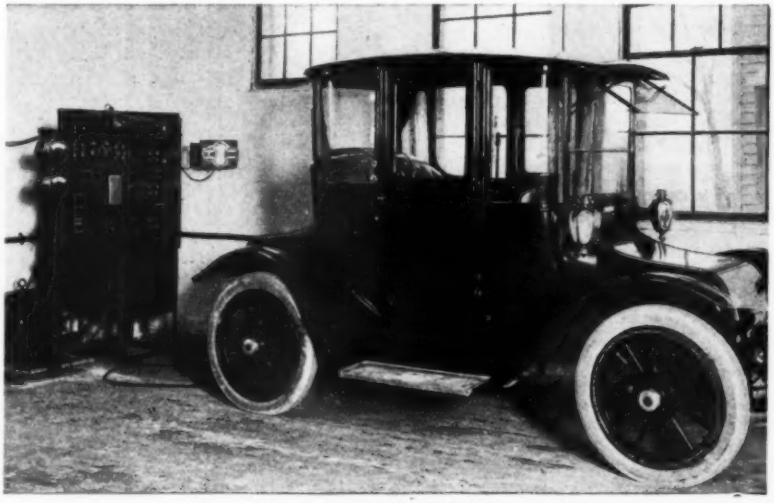
## English Electric Vehicle Committee.

A meeting of this committee was held in London, England, on March 9. The standardization of metal-filament glow lamps for use on electric vehicles was taken up. The committee had before it samples of fittings made by several manufacturers. In view of the restricted amount of room inside these fittings, the committee decided to recommend, as standard for electric vehicles, the lamps of the size and voltage recommended by the Engineering Standards Committee. These lamps are for a pressure of 12 volts. On account of the small energy consumption and the comparatively short hours of use, the committee recommend that, for the present, the lamps be connected across such a number of cells in the vehicle as will give the required voltage, and that a special extra terminal be provided on the cells for this purpose. As to the methods of charging and standardization of charging equipments, the technical subcommittee is still engaged in drawing up a report.

As to tariffs or rates the secretary was directed to write to those London municipal and company electricity-supply undertakings charging more than two cents per kilowatt-hour for off-peak supply, expressing the hope that they will reconsider this matter and come into line with the large number of supply undertakings which have already adopted the committee's standard tariff.

## Charging Equipment of Corey Hill Garage, Brookline, Mass.

The accompanying illustration shows the corner of the Corey Hill Garage, Brookline, Mass., in which the battery charging equipment is located. The service supplied this garage is single-phase alternating current, a Wagner rotary converter being used to furnish the direct current for charging. The leads to the charging outlets are carried in conduit shown running parallel with the floor and about three feet above it. The panel to the right carries four unit-type charging rheostats with a space below for mounting two more. This type of rheostat is made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.



Corey Hill Electric Garage, Brookline, Mass. The Service Furnished is Alternating Current, Single-Phase, and a Wagner Rotary Converter is Used in Connection with a Cutler-Hammer Charging Panel, Equipped with Four Rheostats.

The charging is easily cared for, no technical experience is necessary, and no rod needed to manipulate the rheostats. The rheostat handles are within easy reach conveniently arranged for charging one, or two, three or four electrics at the same time from the one location. Automatic protection against overcharge, against charging back into the line, etc., are easily attained. An instrument switch on each panel permits reading the voltage of any battery on charge. The rheostat units and panels are furnished completely wired, the service and battery leads only need be secured to lugs located accessibly for the purpose. As greater charging capacity is needed more units can easily be added.

## Electric Vehicle in Parcels-Post Service.

The Parcels-Post Delivery Committee of the Electric Vehicle Association of America has issued in pamphlet form its report on the use of electric vehicles in this service. The report is in three parts, of which the first contains a digest of a previous publication of the Association on this subject and of the activities of the Parcels-Post Committee.

The second part, which makes the pamphlet very timely, gives the substance of a 420-page advertisement of the Post Office Department inviting proposals for carrying the mails and for furnishing equipment therefor in cities and towns in the states of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa and Missouri. Bids on this subject will be opened on April 16.

The third part of the report contains extracts from annual reports of different officials of the Post Office Department for the last fiscal year in which particular reference is made to the use of automobile service. The economies obtainable by use of motor-driven vehicles are realized by the government officials and they seem disposed to favor a more extended use of this type of equipment.